SCIENTIFIC AMERICAN

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THE BARRETT SYSTEM OF LIGHTING RAILROAD CARS BY ELECTRICITY.

The problem of maintaining the electric light satisfactorily on rail cars has always been esteemed a difficult one. Everything militates against it. The motion of the cars by its jar tends to disturb the lamp connections, and in effectively providing against this trouble some degree of ingenuity has been called upon. The use of a storage battery as the immediate producer of all the electricity used has already been illustrated and described by us.* This class of plant certainly has done excellent work, but has its attendant disadvantages. Primarily, the storage battery is not as economical as the dynamo. It is charged from a generator at some station, and in discharging itself through the lamps does not return the full amount of electricity absorbed from the dynamo. Again, a storage battery can only run for a certain period at a given rate. If all the lamps are kept lighted, it is only a question of some hours when it will run down completely.

The storage battery by its portability, however, seems to overbalance its defects, and does good work for this special application. The unassisted dynamo, necessarily dependent upon a supply of steam for its running, seems ill adapted for train lighting.

* See SCIENTIFIC AMERICAN, vol. lvi., No. 19, page 287.

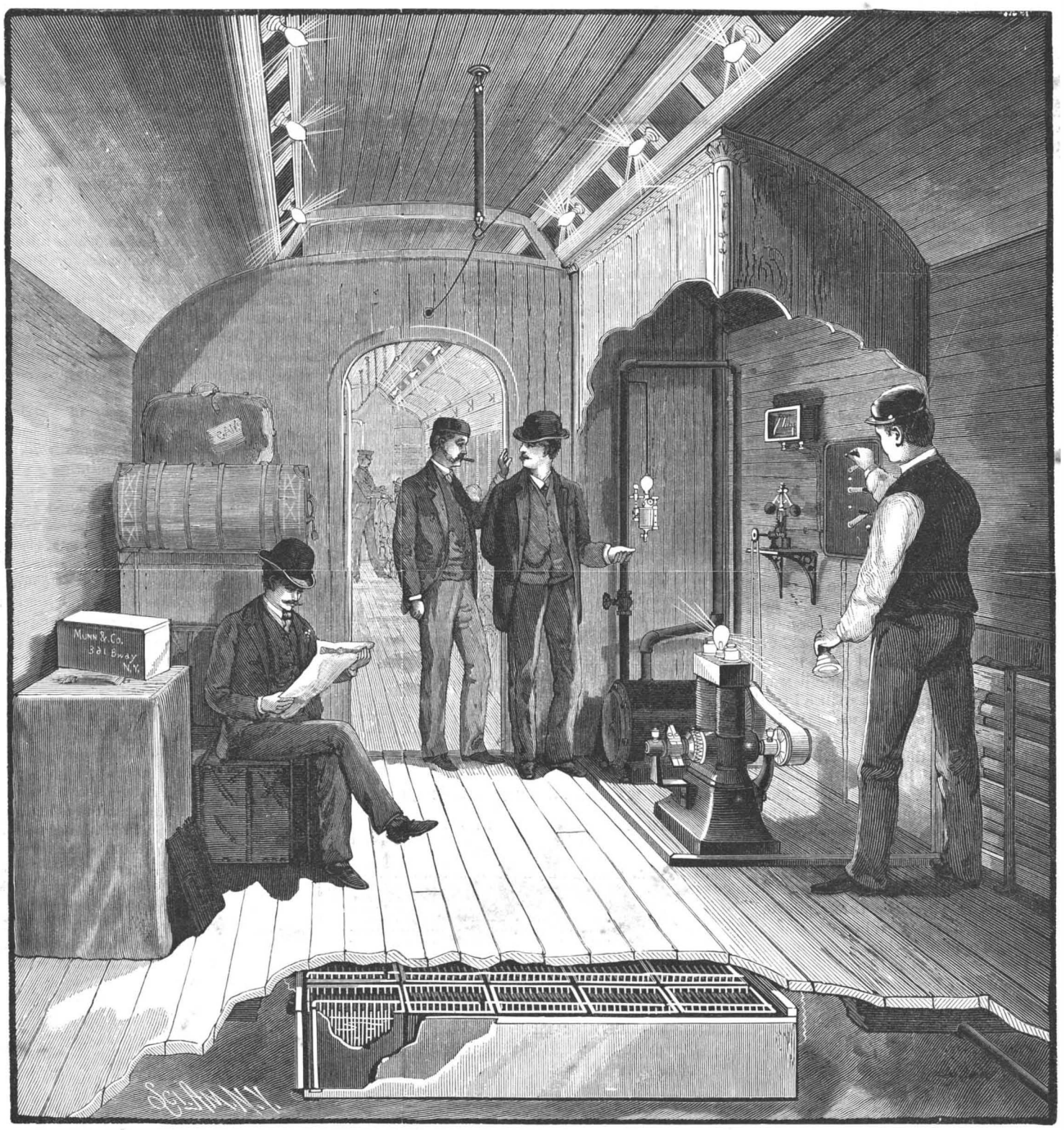
The system which we illustrate to-day, due to Mr. S. H. Barrett, of Springfield, Mass., embodies both dynamo and storage battery, so as to obtain the merits of both. It seeks to overcome the defects of one source of electricity by the use of the conjugate generator. The main lighting agent is the dynamo. As this machine with its motor steam engine works more economically when large, a single generating plant is used to light four or five cars. Not only is economy of generation thus attained, but space is also saved, as the passenger cars have no encumbering engine to take up room and heat the cars, and to annoy by the jar and motion. The dynamo and engine is placed in the baggage car. Steam is supplied from the engine. An eight horse power Colt disk engine with a Tremont Electric Light Company 60 light dynamo is used. A steam hose coupled through to the engine provides the necessary steam connection.

This, with incandescent lamps, fifteen to a car, forms an effective and complete lighting plant, with one exception. As long as the engine is attached, the system will work. It matters not whether the train is stopped or in motion. The dynamo being run by an independent engine will always generate current. But if the locomotive is uncoupled, then the dynamo engine, being deprived of its steam, must come to a stop. If it were necessary to detach one or more of the cars supplied by it, the cars so uncoupled could receive no more electricity from the dynamo, and would be left in darkness. To provide against these contingencies, each car is provided with its own storage battery. Of this, twenty cells are placed in a box under the floor of each car. They are stored or charged from the same dynamo that lights the cars.

Just under the centrifugal governor of the engine an automatic switch is arranged. By the action of this mechanism the batteries are thrown into or out of the dynamo circuit as required. When they run down and the current weakens, the switch closes and they receive a charging current. As soon as charged the switch opens, and cuts them out, leaving them in condition for service whenever called upon. Normally, the greater part of the charging would be done in the day time, so that the action of the dynamo at night, when the cars have to be lighted, need not be greatly complicated by the production of a charging current.

Switches to be operated by hand are also present in the system. By them the car lights can be turned from dynamo to battery or the reverse. Thus the contingency of a breaking down of the dynamo is effectually provided for.

The effect of a car thus lighted is very fine. In place



THE BARRETT SYSTEM OF LIGHTING RAILROAD CARS BY ELECTRICITY.

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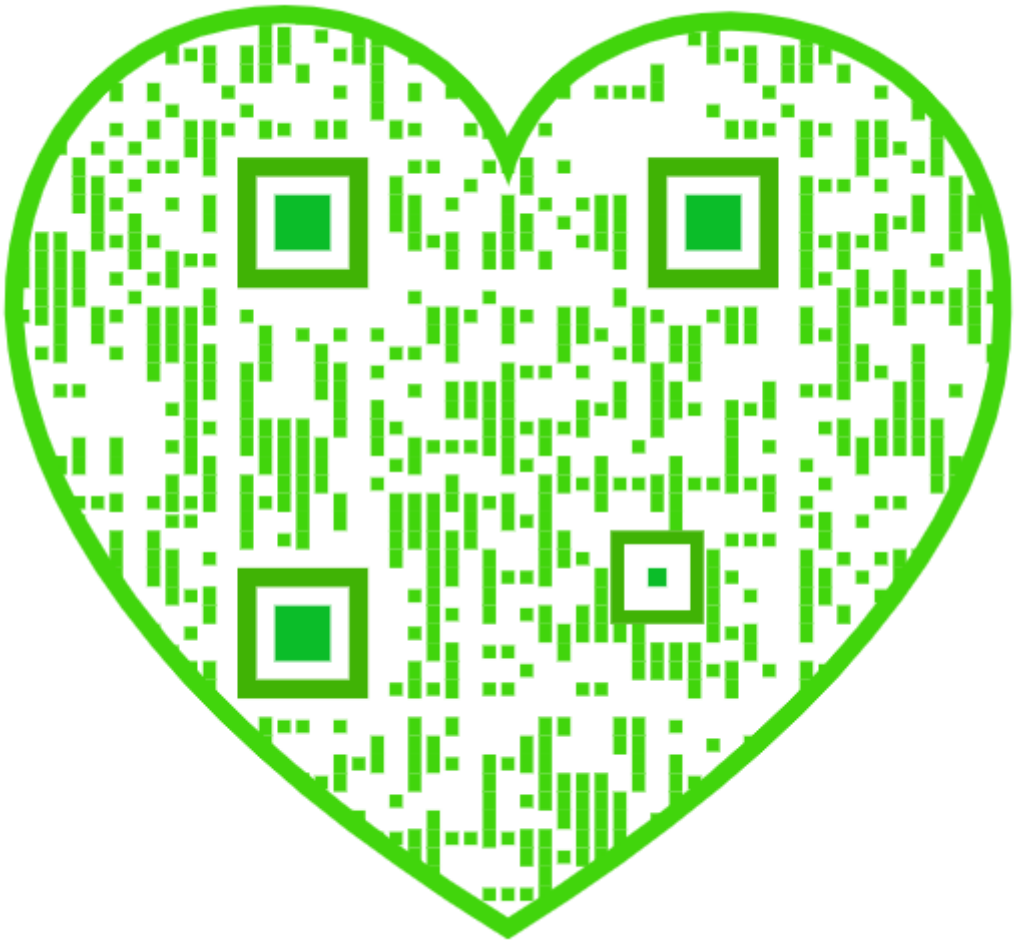

of the unsatisfactory oil lamps a quantity of brilliant incandescent lamps illuminate every corner of the car, so that it is as easy to read by night as by day. The light in its satisfactory qualities compares with gas. The element of safety is also of importance. The danger of fire is the greatest dread attaching to a collision or upset of a train. This danger is greatly increased by kerosene lamps, and it is far from certain that a high pressure gas reservoir may not be an element of risk in a disaster of this class. The electric light would seem the safest of all. The danger of the production of an arc is certainly quite remote. The first action of a collision would be to break some of the electric light leads and cut off the current entirely. It would be very exceptional for the conditions for an incendiary arc to be brought about. At the same time, this is among the possibilities.

The electric light leads are connected between the cars by an extremely simple arrangement. Two half cylinders, whose faces form the contact plates, are held together in a spiral spring socket. This secures them so that no shaking can detach them; while a direct pull, as by the cars uncoupling, will draw them apart without injury. For the steam coupling a species of union or faced joint is employed, held together by a screw and yoke. The joint is a metal to metal one, packing being dispensed with. It is so well made that the faces can be turned or twisted upon each other while the steam pressure is on without an escape. A self-acting plate or valve drops over and above the opening when the line is uncoupled, to exclude sand and dirt. This coupling is of the simplest description, and does away with one of the difficulties of the problem.

The plant we have illustrated is now at work on one of the trains of the Connecticut River Railroad. It forms at least an interesting study of the subject of car lighting, and in its combination of storage batteries and dynamo indicates a distinct step in advance. Sooner or later the electric lighting of cars, like the block system of running trains and safe car heating, must be introduced on our leading roads. Once introduced, they will have come to stay.

A New Heat Measurer.

Mr. C. Vernon Boys exhibited an instrument which he terms the radiomicrometer to the Royal Society, March 24. The instrument is a modification of one invented by M. D'Arsonval, and consists of a minute thermal junction forming one side of a parallelogram of which the other three sides are of copper. This thermo-electric circuit is suspended between the poles of a magnet. It is evident that when radiant heat falls upon the thermo-electric junction forming one side of the parallelogram, an electrical current is formed which turns in the magnetic field, where it is placed so as to include the greatest number of lines of force. The parallelogram made by Mr. Boys embraced one square centimeter. The thermo-electric junction consisted of a bar of antimony and of bismuth, each piece being $5\times5\times\frac{1}{8}$ mm., soldered edge to edge. The circuit was supported by a torsion fiber and provided with a little mirror. With a magnetic field of only 100 units the instrument showed the heat which would be cast on a halfpenny by a candle flame at a distance of 1,168 feet. With a stronger magnetic field the instrument is capable of a much greater sensitiveness. The author calculates that an instrument can be made which would show a change of temperature at the junction of $\frac{1}{10000000}$ of a degree of heat. Mr. Boys also showed a motor which consisted of a cross, the center being antimony and the arms bismuth. To the ends of the arms are soldered four copper wires, the three ends of which are joined by a ring of copper. When the spark from a blown-out match is held near this arrangement, it rotates rapidly. If the spark is held on the right-hand side of the north pole, the motor revolves indifferently in either direction. If the spark is held on the left-hand side, the motor stops. "We have, therefore, an electro-magnetic motor which goes having neither sliding nor liquid contacts."—*Nature.*

The First Lightning Rod.

If we are to believe an Austrian paper, says *La Lumiere Electrique*, the first lightning rod was not constructed by Franklin, but by a monk of Seuftenberg, in Bohemia, named Prohop Diwisch, who installed an apparatus the 15th of June, 1754, in the garden of the curate of Prenditz (Moravia). The apparatus was composed of a pole surmounted by an iron rod supporting twelve curved up branches, and terminating in as many metallic boxes, filled with iron ore and closed by a boxwood cover, traversed by 27 sharp iron points, which plunged at their base in the ore. All the system was united to the earth by a large chain. The enemies of Diwisch, jealous of his success at the court of Vienna, excited the peasants of the locality against him, and under the pretext that his lightning rod was the cause of the great drought, they made him take down the lightning rod which he had utilized for six years. What is most curious is the form of this first lightning rod, which was of multiple points like the one which M. Melseu afterward invented.

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RESTRICTED IMMIGRATION.

It is agreed all around that unrestricted immigration is becoming too much of a good thing for this country, and that the immigration laws should be thoroughly revised, with the view of regulating the coming of foreigners to our shores. The reasons urged against unrestricted immigration are, first, the great increase of crime which is directly traceable to that element in our population proved to be alien to our institutions and unused to our atmosphere of liberty. The statistics collated by Rev. Frederick H. Wines indicate an alarming increase of crime ever since immigrants began to come from Europe in great numbers. This authority has made it pretty evident that in seven States, containing nearly 15,000,000 of the population of the United States, there has been a proportional increase of commitments to State prisons and penitentiaries, from 1820 to 1880, vastly greater than the growth in population.

In New York City, where immigrants delight to herd together, instead of going westward, the police last year made 74,035 arrests, which gives 1 arrest for every 20 persons. Making allowance for those who were arrested more than once, we can still assume that 1 out of every 25 was arrested last year; while the number of persons who had committed crimes but have escaped the clutches of the law is not known. This is a record that should move the serious attention of every patriot to a consideration of an efficient and speedy remedy.

Secondly, the increase of the death rate in the United States, and especially in New York, is said to be largely due to unrestricted immigration. Dr. Eklund, of Stockholm, makes the startling statement that the infants dying under one year of age in the United States average fifty per cent of the number born, while in Europe the death rate of infants under one year of age is twenty-five per cent of all deaths. He attributes this high death rate in America to the fact that "the European defective classes, whose natality and infantile death rates are enormous, are forcibly exported in great numbers to this country."

The *Medical Record* virtually indorses his statement by acknowledging that "it is very true that the numbers of our sick and defective classes are enormously swollen by the immense tide of immigration. It is safe to say that four-fifths of the infant mortality is among the children of the immigrants."

Thirdly, it is said in favor of restricted immigration that the immigrants' opportunity for getting employment is now less than it was fifteen years ago, when there was much railroad building and great industrial expansion. This is not so easily proved as the first two statements. For it is absurd to say that a man's opportunity to obtain work is less now because fewer railroads are in process of construction, when there is plenty of capital lying idle waiting for good investments, and an immense tract of country ready to receive the plow of the sober and industrious husbandman. The reason why a laboring man has not the same chance to make a living now as he did fifteen years ago is because of the disturbances in the labor market—the strikes, the boycottings, and the attacks on others' right to work, of which labor organizations have been guilty. The fault, then, lies in the *character* of workingmen themselves, and *not* in the supposed industrial decline of this growing country. But, as the lately arrived immigrant is generally the most discontented of laborers, the conclusion is easily reached that unrestricted immigration is chargeable with most of the labor troubles, which have resulted disastrously for laborer and capitalist alike, although the latter can stand it much longer than the former.

In view of these facts, there can be hardly any difference of opinion concerning the *necessity* of building a breakwater to resist the tide of immigration by legislative enactments and rigorous execution of the same. But in regard to the minor details, the *modus operandi*, there is likely to be much diversity of opinion. We do not wish to exclude those industrious and sober people whose intention is to seek honest work in America. On the other hand, Uncle Sam decidedly objects to having his substance eaten up, and the safety of his house threatened by organ grinders, beggars, tramps, socialists, anarchists, and other parasites of society. We must draw the line somewhere. It is not hard to determine where we ought to draw it, but how to make the rule work is another matter. It would be the wiser part to leave the details to those who have given the subject the most careful consideration. We would simply and humbly suggest that our consular service can be expanded so as to include among its duties that of ascertaining and certifying to the condition, character, and intentions of all who desire to come to America in the quality of immigrants.

BRITISH NAVAL MANEUVERS.

The recent maneuvers of the British fleet did little to encourage those who pin their faith to monster ships and heavy armor. Indeed, even the unbelievers in this type were scarcely prepared for the sorry spectacle presented by the mightiest fleet afloat, for in the Irish Channel, where Admiral Baird essayed to defend the shore line against the assault of Fitzroy, and again in the English Channel and North Sea, when Hewitt

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sought to pierce the line of Freemantle, the big ships proved at best both awkward and uncertain.

There were several collisions and many breakdowns; in all a dozen ships out of two score were disabled by their own exertions, or gave out from lack of coal during the fortnight of evolution. The great ships Ajax and Devastation crashed into each other early in the day, and it was only by quick work, and what must be regarded as good luck, that the latter did not go down. As it was, she was badly listed over on to her side, with her guards under; something heavy in the way of machinery having been sent adrift below. The Ajax was disabled and lay like a dead whale in everybody's way, and a constant menace to all. The new steel cruiser Curfew, from which so much was expected, was so awkward to handle and so slovenly in minding her helm that, when the report came, she had broken down, and powerful tugs were sent by Admiral Hewitt to tow her into port, a sigh of relief must have gone up among the fleet, for, from the descriptions given of her movements, she seems to have been as deadly as an iceberg, quite as dangerous to friend as enemy, and required a whole ocean to herself. Then there was the Colossus, of which so much has been written—the floating fortress, carrying enough power to cripple a fleet! Unless she can do better than her recent performance promises, no fleet need fear her, for, in order to sustain injury, it would have to come up and considerately lie to, possessing itself in patience while the really formidable battery was trained; for it is said to have taken an hour and thirty minutes to work the Colossus into position and load, train, and fire the after guns on the port side. After firing one round, the big ship fell back disabled, and lay helpless in the tideway.

The Terror might not inappropriately be renamed the False Alarm, and the Imperieuse, the Impotent; for the former on two occasions thundered down upon the enemy, and, when at point blank range, was unable to train her battery till she had passed the target, having then to run over a circle of a mile's diameter to get around again into position, while the Imperieuse fell out of line because running short of coal—bless the mark! And when again her bunkers were full, she was so slovenly in a cross sea as to be well nigh unmanageable.

When we remember that the rate of speed at which the ships were working was only *seven knots an hour*, and that, notwithstanding they were within easy reach of a great coaling station, several of them ran short of coal while maneuvering, we cannot help wondering what would happen such a fleet fighting in mid-ocean! It may safely be said that if the result of the fortnight's maneuvers is a fair exponent of what a fleet of monster ships are capable of, we need have little fear of attack by such vessels on this side the water. Few of these large ships could carry anything like enough coal to bring her across, and those so capable would be compelled to coal at some station here before ready for aggression or, barring that supply, be unable to get home again. Hence, blockade or capture of the coaling stations would render such a fleet harmless.

It ought to be said for the officers in command of this great fleet that they are as capable a lot of men and as able seamen as can be picked up on the ocean. Experienced, too, they are in all manner of novel machinery and war material, used to working modern ships, and, quite as important, familiar with the waters they sail in. It was no fault of theirs that some of the monsters they commanded carried weather helms with wheels hard over, or, as was the case with another, parted the shaft while trying to work head up to wind with engines of 8,000 horse power. All attempts to form line of battle, whether in the form of column, crescent, or wedge, were fairly unavailing from a naval standpoint, because the time occupied was so prolonged as to give a quick-witted enemy opportunity to anticipate the maneuvers and evade the shock. The big ships on several occasions rammed one another while getting into line, and breakdowns and demands for assistance marked the most important maneuvers. This was no fault of the commanders, but of the ships; being built to carry great batteries and bear ponderous armor rather than for seaworthiness and rapid movement.

History tells us that when that hardy old landsman-sailor Blake came up with the Dutch Admiral Van Tromp, off the Hague, he set his signal for close order for a hand to hand encounter, and we are told that not a captain failed to bring up his ship clear; and the great Nelson, in the Victory, which, by the way, still lies in Portsmouth harbor, and was a witness of part of the recent maneuvers, saw every ship run free of its neighbor when at Trafalgar he gave his order to "Advance the line!"

It is not difficult to guess what would happen should such a fleet as that recently maneuvered in British waters suddenly get an order to form line say in crescent, as was Van Tromp's when protecting the Dutch East Indian fleet, or in double column, as was the British when bearing down upon the Spanish Armada. There would, like enough, be some sharp and destructive internecine work before the enemy was reached. The work of the torpedo and torpedo boat, from which so much is—not unreasonably—expected in future naval wars, seems to have been purposely underestimated at the maneuvers this year, as it was in the French maneuvers last year, for fear of shaking the sailor's faith in the impregnability of the ships he sails in. A splendid fleet of torpedo boats lay fairly inactive in the Irish Channel while Fitzroy thundered away at Baird's retreating ships, while, had they really meant business, a serious torpedo boat attack, if it did not blow up or beat off his ships, would, at least, have served to dampen his ardor and disturb his aim.

The Kindling Wood Industry, New York.

At the corner of Eighteenth Street and Avenue B is located one of the largest kindling wood factories in the world. The factory can turn out seventy cords of wood per day, sawed, split, and ready for the burning. Oak, pine, and hemlock are fed to singing buzz saws and insatiable chopping knives. The hickory is brought from the northern part of this State and from Connecticut and Pennsylvania. It is mostly burned in open fires, and is cut in pieces from eight to forty-eight inches in length. Hickory is worth $18 per cord piled in the cellar. Five vessels, with a combined capacity of 1,275 tons, are constantly employed bringing pine from Virginia to the factory. These vessels make twenty trips each during the year.

The oak is grown in this State and Connecticut, and the hemlock comes from the lumber districts of New York State. Hemlock is brought to this city in strips about four feet long and one and one-half inches square. These strips are put into a machine run by steam, which, at one revolution of sixteen saws, cuts them into pieces three inches in length. These pieces are then dumped into a big wooden hopper around the edges of which are ranged benches. Into these benches are set oval iron machines operated by steam by means of a treadle.

Men are paid at the rate of 25 cents a hundred bundles for forming the wood into bundles and tying it with tarred rope. The machine presses the pieces of wood so closely together that the rope often cuts into the wood. Six hundred bundles a day is considered a fair days' work for a man, although an exceptionally quick workman has been known to put 800 bundles together. Over one of the machines hangs this legend:

We work for cash,
And not for fun;
And want our pay
When the work is done.

Upon a rail hangs a dilapidated tin pail, which hides this warning:

This can is not to be lent outside of this shop. The can is never rusty inside.

The wood in the bundles sold in the grocery stores containing pieces nine inches in length is cut with a buzz saw and fed into a machine which carries the sawed pieces under a knife like the letter X. This knife cuts as much wood in fifteen minutes as a darky could chop in a day.

From May till October very little business is done at the factory. The sale of oak wood has fallen off greatly during the past few years. Cut oak wood is worth $14.50 a cord. Pine brings the same price. There are about 128 cubic feet of wood in an ordinary stick of pine timber.—*New York Sun.*

Soiree of the Royal Society.

The recent ladies' *soiree* at the Royal Society, London, was largely attended. Careful preparations had been made for it, and it was a great success. At intervals, in the principal library, a cornet solo was telephoned from Brighton. A large number of objects of great scientific interest were exhibited. Photographs of clouds and photographs of the Firth of Forth Bridge were shown with the lime light; the former with demonstrations by the Hon. Ralph Abercromby, the latter with demonstrations by Mr. Baker. The microscopic structure of pearls was also shown with the lime light, by Dr. George Harley. The Zoological Society of London exhibited a fine living specimen of the electric eel, from which shocks were taken. Professor A. W. Rucker exhibited—1. Colors of soap films rotating under the influence of an air current. A jet of air is directed on to the film so as to form a vortex, the colors of which change as the film becomes thinner. This experiment is due to Sir David Brewster. Attention has been recently called to it by Lord Rayleigh. 2. Artificial imitation of the colors of the setting sun. Light is passed through a glass cell containing a solution of sodium hyposulphite. If a little hydrochloric acid is added, the sulphur is deposited in fine particles which scatter the blue end of the spectrum. The transmitted light becomes redder, and colors like those of sunset are produced. This experiment is due to Captain Abney. 3. Apparatus to illustrate the passage of light through lenses. An application on a large scale of the method of tracing the rays by passing them through air in a closed space charged with a small quantity of smoke. Chrysalides and living larvæ showing the influence of surroundings upon their colors were exhibited by Mr. E. B. Poulton; and Dr. E. Klein exhibited the following specimens of microbes under the microscope and in cultivation: *Bacillus anthracis; Bacillus tuberculosis;* bacillus of leprosy; bacillus of swine fever; bacillus of septicæmia; bacillus found in typhoid fever; spirillum found in Asiatic cholera; several other species of spirilla; several species of *Bacterium termo;* micrococcus of foot and mouth disease; micrococcus of scarlet fever; micrococcus of vaccine; different species of colored microbes. Mr. Chichester A. Bell showed apparatus for reproducing audibly the vibrations of liquid jets. Vibratory motions of the orifice from which a liquid jet escapes give rise to slight swellings and constrictions of the liquid column. The swellings increase and the constrictions diminish as the jet travels downward, finally causing it to break into drops. When the jet strikes upon a flat surface, the swellings are continued as waves in the thin sheet of liquid, which spreads out from the point of impact. The jet liquid being a conductor of electricity (acidulated water), and two platinum electrodes in circuit with a battery, and a telephone being immersed in the liquid sheet or nappe, the jet vibrations are reproduced as sound in the telephone.—*Nature.*

Mountant for Photographs.

A really good medium for mounting photographs is a thing still to be desired, for although there are many in the market, each has some drawbacks. Most of them cockle the print, and one or two smell most abominably. Some time since, Mr. John Spiller recommended a mixture of gum water and glue, for which he claims several advantages. The interval which elapses before the mixture sets is much longer than with plain glue, and the compound is so pale in color that any excess can be wiped from the edge of the mounted print by moistened cotton wool, without leaving a stain on the mounting card. Here is the method of compounding this mountant:

Equal weights of best glue—we presume that a good, hard gelatine would answer the same purpose—and gum arabic are separately soaked in cold water. The gum will dissolve altogether, but the glue will swell up by absorption of water. The latter is then transferred to a water bath or glue pot, and when it is perfectly liquefied, the solution of gum is added to it. Thoroughly stir, strain through muslin, and bottle off for use. The compound must be warmed before application to the print, and a stiff brush should be used, so as to insure a thin, even coat upon the paper.—*The Camera.*

The Great Southern Comet (1887 a).

Dr. J. M. Thome, of the Cordoba Observatory, has published in the *Astronomical Journal*, No. 156, some interesting particulars as to the appearance and observed positions of the great comet which he discovered on January 18. On the 21st it became evident that the comet was, in effect, all tail, the head being much the fainter part of the object, and being at least 15′ in diameter, very thin, and without nucleus or condensation of any kind. After various attempts at determining its co-ordinates, Dr. Thome adopted the plan of moving the telescope along the axis of the tail until reaching a point beyond which nothing of a nebulous character could be distinguished, and determining its position. These points were approximately half a degree in advance of the true center of the nebulosity and nearly in its axis. The observations of position extend from January 21 to January 27. With regard to the appearance of the comet to the naked eye, Dr. Thome remarks that it was a beautiful sight—a narrow, straight, sharply defined graceful tail, over 40° long, shining with a soft, starry light against the dark sky, beginning apparently without a head, and gradually widening and fading as it extended upward.

Friction on Railways.

The Brake Committee of the Master Car Builders' Association (Burlington tests) says:

Your committee believe from these experiments that the following figures represent the frictional resistance of long trains of freight cars, in good repair, running over a track in good condition, the weather being fine and warm, and the wind light. The resistance appears to be constant at speeds of from 12 to 25 miles per hour, and does not appreciably increase with an increase of speed within these limits.

Frictional Resistance, pounds per ton of 2,000 *pounds.—Speed* 12 *to* 25 *miles per hour.*

	New cars.	Old cars.
	lb.	lb.
On tangent	8·00	6·00
On 3° curve	10·50	8·30

Good lubrication and carefully fitted boxes and journals may, with cars that have been running some time, decrease this resistance to a minimum of 4 lb. per ton on the tangent, while brake shoes rubbing against the wheels, and other unfavorable conditions, may increase the friction on the tangent to 12 lb. per ton, and to considerably more on curves. The use of outside-hung shoes seems to increase the resistance on curves when the shoes are very near the wheels.

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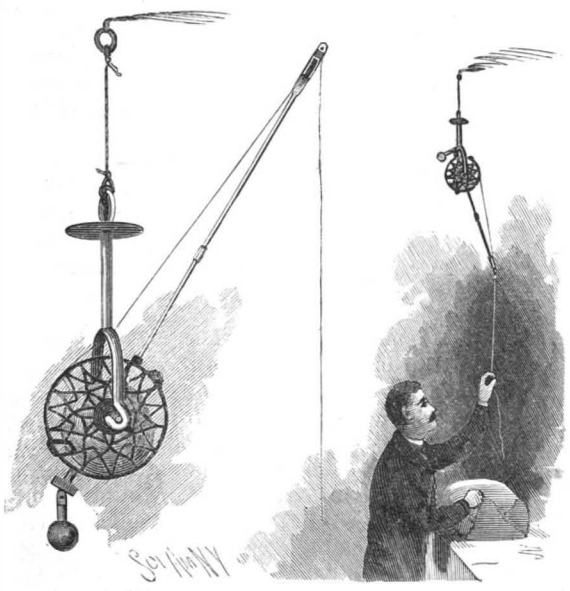
Lunar Eclipse.

The eclipse of the moon on August 3 was visible in England. In London the night was clear, and the middle and subsequent stages of the eclipse were very plainly perceptible. The middle stage occurred at 8 h. 49 m., rather more than one-third of the moon being hidden. The time of last contact with the shadow and penumbra were 10 h. 2 m. and 11 h. 26 m., respectively.

"Except for brief intervals the sky was clouded in the Berlin district at the time of the partial eclipse of the moon this evening. The eclipse began at 8 h. 29 m., and the maximum stage was reached at 9 h. 42 m., when five-twelfths of the moon's surface was obscured; the eclipse being over at 10 h. 56 m."

AN IMPROVED OVERHEAD TWINE HOLDER.

A revolving twine holder that is adapted to lift the loose hanging end up out of the way is shown in the accompanying illustration, and has been patented by Mr. Thomas Porter, of No. 1229 Cherry Street, Philadelphia, Pa. The cage or holder is hung by gudgeons in a stirrup-like hanger, so that the holder may be readily rotated. A short arm, weighted, projects from one side of the cage, and opposite thereto projects a



PORTER'S TWINE HOLDER AND LIFTER.

rod which lifts the slack of the twine, and operates to make some tension thereon as the twine is drawn out. When drawing on the pendent portion of the twine, as for use in tying a parcel, the lifting rod is drawn down and the short, weighted arm carried around to the top of the cage, as shown in one of the views, the other figure showing the normal position of the holder, with the end of the cord drawn up out of the way when not in use. The disk above the holder forms a guard for the lifting arm or rod to strike against when the twine is severed after tying the parcel, to keep the rod at a good working angle to lower when pulled down upon by the free end of the twine.

THE BRUSH TURKEY (*Talegallus lathami*).

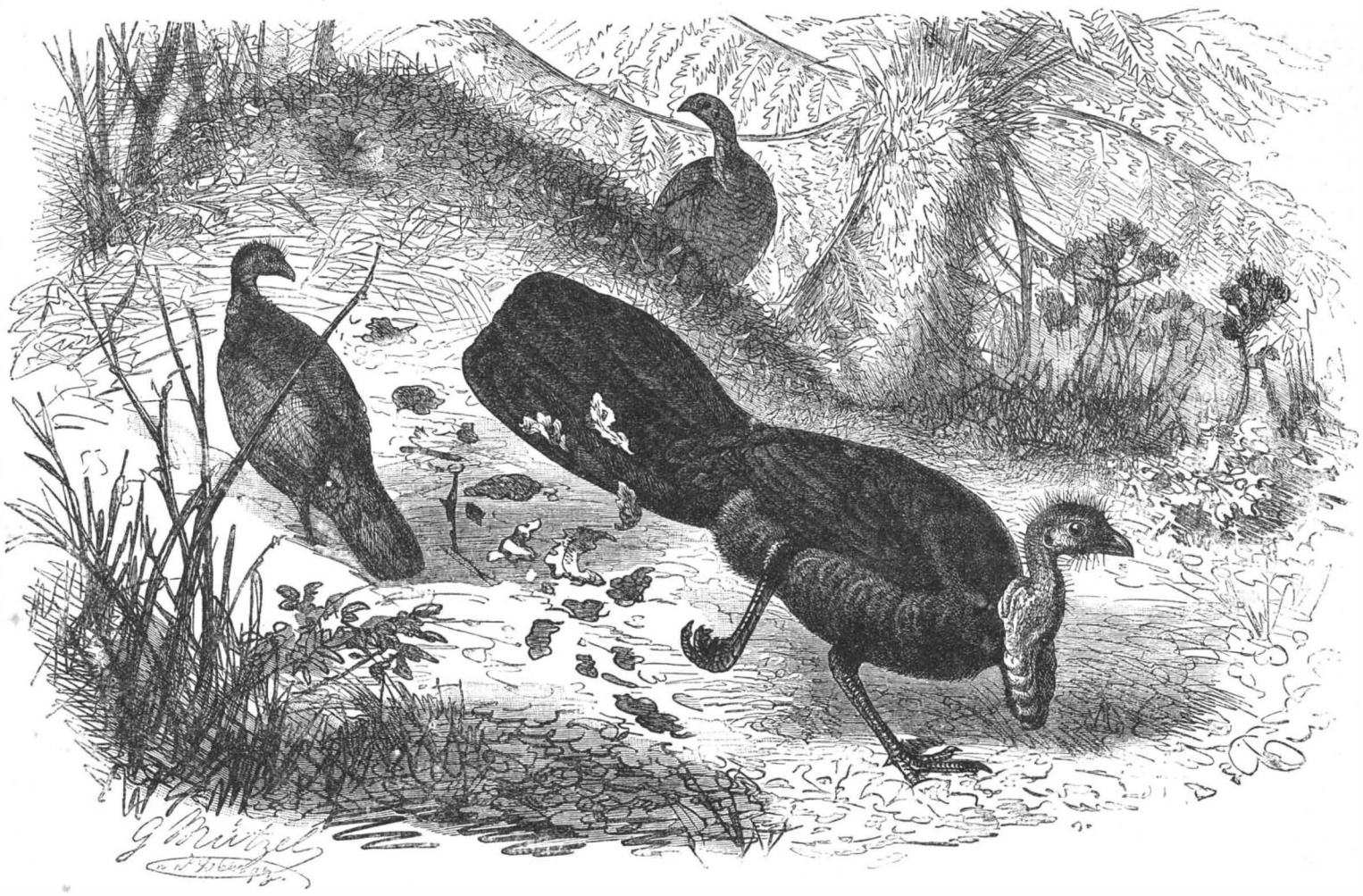
"All birds hatch their eggs." Zoology knows very few exceptions to this rule, and although old works on natural history state that the sun relieves the ostrich of this duty, it is now known that she attends to the work most conscientiously. Only the cuckoo succeeds in shirking this business entirely, leaving her little ones to the mercy of kind-hearted little singers. Besides this bird, we may mention the brush turkey as one which does not hatch its eggs, but it is more conscientious about the matter than the cuckoo.

The brush turkey (*Talegallus lathami*) is a powerful bird, attaining a size of about 31 inches, and can be recognized by its powerful build, rather long neck, large head, sharp bent beak, strong feet, and short, rounded wings. The scarlet of the featherless neck and the yellow pouch dependent therefrom stand out in decided contrast to the brown plumage. The home of the brush turkey is in the thick forests of Australia (New South Wales), where they live in flocks. Their flesh is very excellent, and they are hunted to such an extent that their extermination is only a question of time.

Judging from the size of their brains, one would not expect these turkeys to be very intelligent, but the way in which they hatch their eggs is so peculiar as to give a favorable impression of their capacity for thought. At mating time (in the spring) the male develops a surprising amount of activity and industry. He picks out a sheltered spot for a nest, and then goes to work to build a mount. With his strong feet he throws a quantity of leaves, fibers of wood, small twigs, dry grass, etc., into a heap behind him, and this forms the center of a large circle, the periphery of which soon appears perfectly clean; and a mound about a yard and a half high is built. While other birds go at once to their newly prepared homes and begin to lay their eggs, the brush turkey pursues an entirely different course. The wise creature waits several weeks until the fermentation and decomposition of the vegetable matter in the heap has generated a heat of about 104° F., the temperature required for either natural or artificial hatching of eggs.

It is wonderful to see with what certainty the birds determine upon the proper time. The male often mounts the nest to examine it, scrapes off a little here and a little there, and then covers the places over again carefully. When he finds that the temperature of the mass is what it should be, he digs numerous holes about the axis of the mound, and in each one of these holes the female drops an egg with the blunt end up. After the male has closed these holes both birds go away, the male only returning from time to time to regulate the heat, covering the eggs more or less, according to the moisture and temperature of the atmosphere. After about three weeks, the young are hatched. They are entirely covered with feathers, their wings are well developed, and they seem as strong as our domestic chickens. The whole process reminds one of the development of the butterfly, which is able to fly soon after leaving the chrysalis.

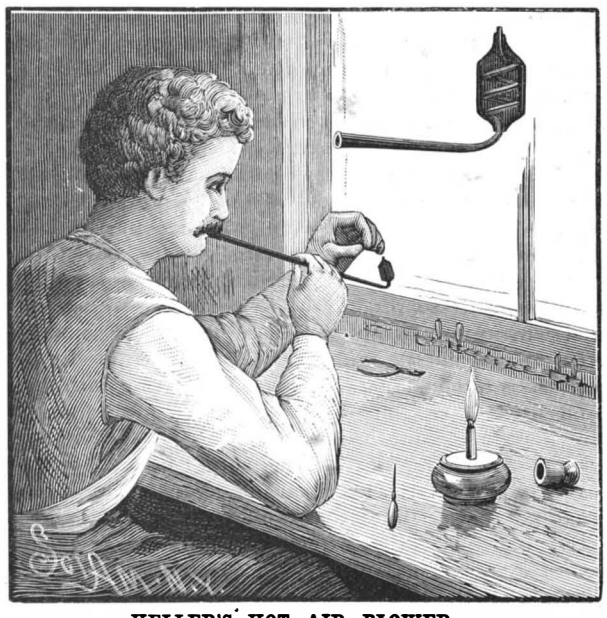
After about twelve hours the young brush turkeys appear merry and active, wandering about with their parents, but in the afternoon they are buried in the nest again by their careful father. On the third day they are able to fly, and after that are perfectly independent. Their process of hatching has been repeatedly carried out by brush turkeys in captivity, as, for instance, in the Berlin Zoological Garden, when they formed the center of attraction for friends and students of zoology.—*Deutsche Illustrirte Zeitung.*



THE BRUSH TURKEY (TALEGALLUS LATHAMI).

A DEVICE FOR HEATING A JET OF AIR.

A tool to be used for the heating of shellac, etc., as employed in the setting of jewels, pallet stones, and similar work, is shown in the accompanying illustration, and has been patented by Mr. Frank Heller, of Oakland City, Ind. It is made by forming twists or coils in the discharge end of a blowpipe, and surrounding these twists or coils by a ball or jacket of metal, the nozzle projecting outward through a proper opening. This ball or jacket of metal having been previously heated, the air forced through a tortuous course within such body of heated metal affords a hot blast, which may be delivered against the shellac without subjecting the surrounding parts to the action of the flame by which the heat is produced.



HELLER'S HOT AIR BLOWER.

STENCIL INK.—A good basis for stencil ink is made with shellac 2 ounces, borax 2 ounces, water 25 ounces, and gum arabic 2 ounces. Boil the borax, shellac, and some water until they are dissolved, add the gum arabic, and withdraw from the fire. When the solution has become cold, complete 25 ounces with water. For black ink use fine lampblack, for red Venetian red, and for blue ultramarine and chalk. Add these to the basis in sufficient quantity to make the mixture of proper consistency.

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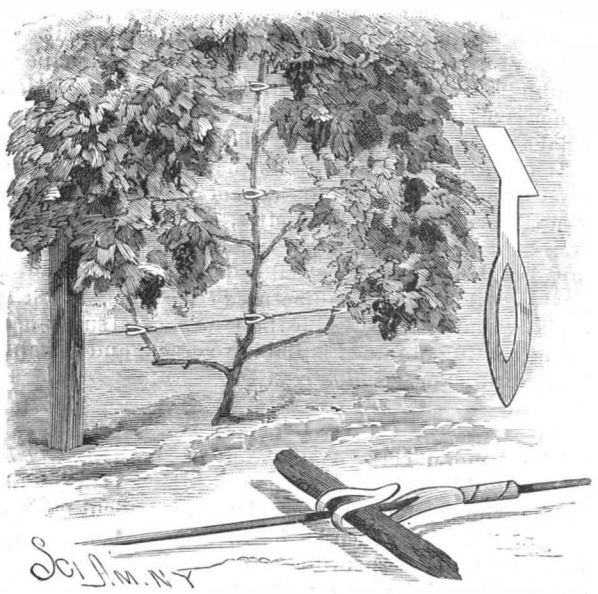
A SPRING HOLDER FOR SECURING VINES.

An extremely simple and easily applied device for holding vines in position is shown in the accompanying illustration, and has been patented by Mr. John Stangl, of Harlem, Clay County, Mo. It is cut or stamped from sheet metal, making a flat blank having

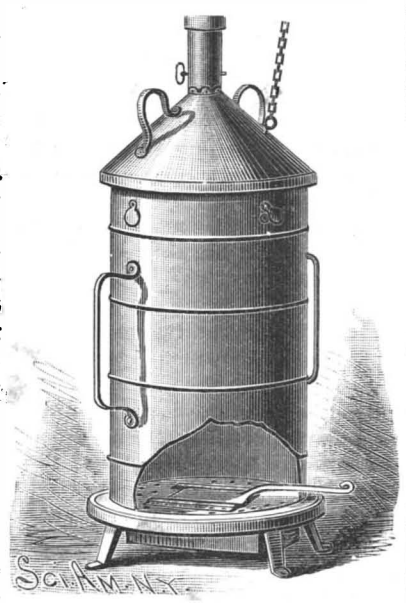


STANGL'S VINE SECURING DEVICE.

more or less spring, one end being elongated and with a longitudinal slot or opening, and the other end shaped to form flat angular lips. To apply this blank to a wire used to support the vine, it is bent to a clip or hook shape at its slotted end, and the lips are twisted or bent around the wire to form a closely fitting tube, the vine being introduced between the wire and the tongue of the hook, which thus makes a yielding holder. By the use of these holders a great deal of labor is saved as compared with the ordinary method of tying the vines by strings, while the device is more durable, and, the holder being wide and flat, it cannot cut the vine.

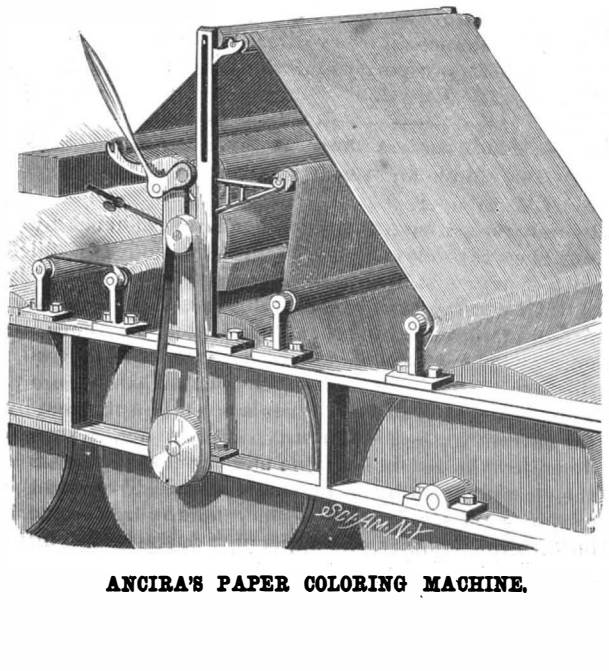
AN IMPROVED STRAW BURNING STOVE.

An easily manageable, inexpensive, and efficient stove for burning straw is shown in the accompanying illustration, and has been patented by Mr. Alonzo E. Smith, of Frankfort, Dakota Ter.



SMITH'S STRAW BURNING STOVE.

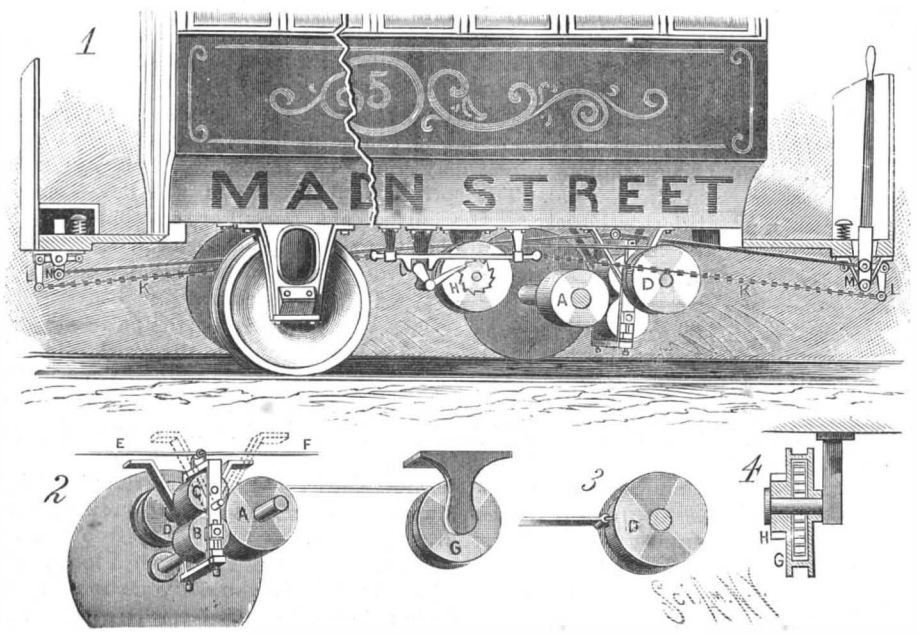
The drum of the stove is of sheet metal, and has a bottom plate fixed to it by a flange overlocking an outbent flange on the body, the bottom plate resting loosely on a base plate supported by legs in the usual way, and carrying an ash receptacle. In the bottom plate is an opening, registering with a similar opening in the base plate, and controlled by a damper, the handle to operate which extends out at the front. The draught pipe extending from the cone top of the stove passes telescopically into a draught flue, the cone top having a couple of handles whereby it may be lifted from the stove body, the pipe sliding in the flue, and the top itself supported, if desired, by a chain attached to an overhead support. The stove body may then be removed and recharged with fuel, and when returned to its place on the base, the fuel is lighted on the top, the cone top fixed in position, and the upper and lower draughts opened until the fire is well started, after which the dampers should be kept open only as desired to regulate combustion. The fire burns away from the side walls and leaves a core or cone of live embers, which may be made to last a long time and throw out a great heat.



ANCIRA'S PAPER COLORING MACHINE.

AN IMPROVED CAR STARTER.

A car starting mechanism which may be readily controlled by the driver at either end of the car, to start the car either forward or backward, is shown in the accompanying illustration, and has been patented by Mr. Daniel Lynch, of Olmstedville, Essex County, N. Y.



LYNCH'S CAR STARTER.

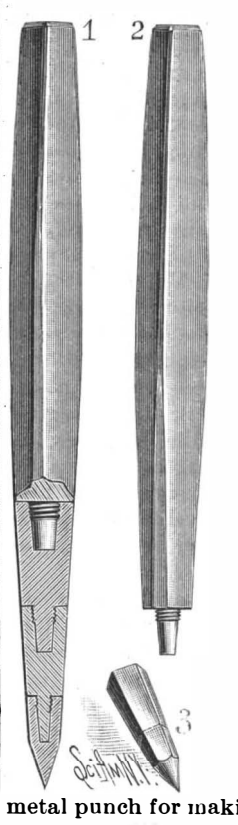
Fig. 1 is a perspective view, partly in section, Fig. 2 is a detail perspective view of principal parts of the mechanism, Fig. 3 shows the connection of the spring tension band with the barrel on one of the friction wheel shafts, and Fig. 4 is a vertical sectional elevation of the starter spring, with its barrel or case and attached ratchet wheel. To the axle of the wheels there is fixed a friction drum, A, against which friction wheels, B C, fitted in a frame, are adapted to act, this frame being so pivoted that either of the wheels may be brought into contact with the drum. On the shaft of the friction wheel, C, there is fixed a barrel, D, to which is connected one end of a band or belt, the other end being secured to the periphery of a case or barrel, G, within which is fitted a coiled spring, the case being journaled on a shaft fixed in a hanger pendent from the car body. One end of this spring is fixed to the shaft, and the other end to the case, to which also is fixed a ratchet wheel, H, with which a dog pivoted in a hanger fixed to the car body is adapted to engage to prevent the unwinding of the spring until the dog is tripped. The connection of the band with the barrel, D, is such as to allow the band to wind in either direction on the barrel. To the top of the pivoted friction wheel frame there are connected two rods, E F, extending to either end of the car, where they are connected with levers, M, whereby the contact of the friction wheels, B C, with the axle drum, A, is controlled. The dog pivoted to a hanger on the car body, and adapted to engage the ratchet wheel, H, on the spring barrel, G, is connected by chains, K, to elbow levers, L, at either end of the car, operated by foot plates attached to the platform.

In stopping the car, the driver pushes the vertical lever from him, thereby carrying the lower friction wheel against the friction drum, and also operating the barrel, D, which, through the belt or band, turns the spring case to store power therein, as the band is wound upon the barrel, D, and the ratchet wheel and dog prevent the recoil of the spring, the friction wheel also operating on the axle as a brake to stop the car. When the car is to be started, the driver, pressing upon the foot plate, operates one of the chains, K, tripping the dog from the ratchet wheel on the spring barrel, thus releasing the spring, and at the same time pulling the vertical lever toward him, brings the upper friction wheel in contact with the car axle drum, A, so that as the spring recoils, the band will be rewound on the spring case, G, and unwound from the barrel, D, and the direct pressure of the friction wheel on the axle drum will correspondingly contribute to turning the car axle and wheels and moving the car forward. If, in starting the car, it is desired to back it, the recoil of the spring may also be utilized for this purpose. When a car has only one driving platform, as is obvious, the rod, chain and lever connections need only extend to one end of the car.

AN IMPROVED MACHINE FOR COLORING PAPER.

The invention herewith illustrated provides a simple and effective machine for thoroughly coloring one side of a web or roll of paper, which has recently been patented by Mr. Gonzalo G. Ancira, of Guadalajara, Mexico. The machine has the usual revolving heated drying rollers, from the middle one of which the web is led up over a roller mounted in a bracket projecting from standards secured to the main frame, the standards carrying an attachment for coloring the web or paper on one side only. From this roller the web passes between the color cylinder and the pressure roller, thence around another roller, and upward under a tension roller, two further rollers conducting it to the drying cylinder. When it is desirable to interrupt the coloring process, the operator presses the lever shown, whereby the pressure roller is swung upward and permits the web to rise out of contact with the color cylinder. The color supply from the fountain is regulated by means of a stop cock, and the tension roller has a free vertical motion in the slotted standards, whereby any slack is taken up that may occur between the rollers.

For further information relative to this invention address Mr. J. A. Medina, Nos. 104 and 106 John Street, New York City.



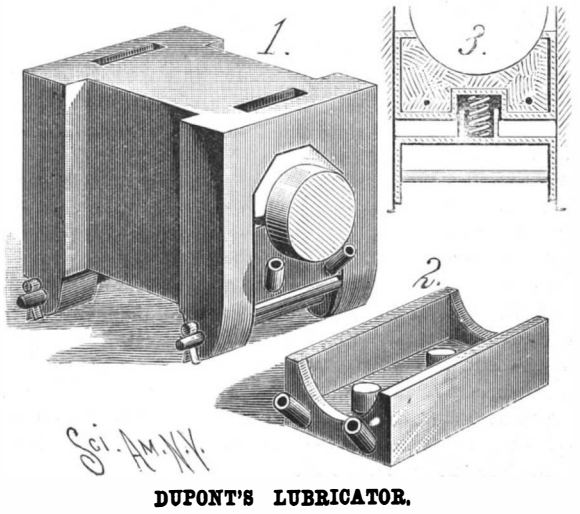
AN IMPROVED NAIL SET.

A sectionally constructed nail set, or nail set and punch combined, adapted to act upon variously sized nails, from spikes to brads, is shown in the accompanying illustration, and has been patented by Mr. Richard W. Trotter, of No. 449 Warren Street, Brooklyn, N. Y.

The upper or stock part of the tool is solid or entire, while its lower part is composed of any number of thimble-like extensions, each succeeding one transversely smaller than the other. With this construction one tool is made to take the place of several nail setting tools of different sizes. The lowermost section of all is made rounded, or conical and pointed, in the form of a punch tip, adapted to screw on to the lowermost shank, whereby the nail set may be used as a metal punch for making round holes.

IMPROVED LOCOMOTIVE JOURNAL BOX LUBRICATOR.

An improved lubricator for use in connection with journal bearings, and especially designed for use with locomotives, is shown in the accompanying illustration, and has been patented by Mr. Benjamin E. Dupont, of No. 117 Spring Street, Lexington, Ky. A case is made to closely fit the under side of the journal, the upper edges of the sides of the case having inwardly extending flanges to prevent the packing from being drawn out of the case by the journal in its revolutions. Housings, in which are mounted spiral springs to hold the case against the journal, are fitted within the bot-



DUPONT'S LUBRICATOR.

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tom of the case, and project downward to enter sockets carried by a supporting plate, as shown in Figs. 2 and 3, the supporting plate being arranged for connection with the lower open end of the journal box by means of depending apertured ears. The interior of the case is partially filled with waste or other fibrous material, to act as a conveyer of the lubricant to the journal, and the case and its springs having been properly adjusted in position, the lubricant is poured in through the tubes shown at the side, their internal apertures being near the bottom of the case, so that it will be impossible for any grit or cinders which may enter to come in contact with the journal. The springs constantly hold the lubricator closely to the journal at all points, and all the lubricant taken up has to pass through the waste or fibrous packing.

The Parcel Post.

The announcement is made that the Post Office Department has established a parcel post service between the United States and Mexico, and certain islands in the West Indies, by which packages weighing not more than four pounds and a fraction, by which we suppose is meant two kilogrammes, can be sent through the mails, and delivered to the person addressed upon payment of the custom dues. We are glad that so much has been accomplished, and hope that the extraordinary facilities enjoyed by those persons who have business with Mexico will call the attention of their neighbors, whose business relations are with other countries, to the inconveniences under which their transactions are carried on, as compared with the postal facilities enjoyed by the inhabitants of all other civilized countries. The absence of a parcel post service, both inland and foreign, is a disgrace to the government of the United States. The Postmaster-General seems, from his annual report, to have made a small effort to give his fellow citizens such use of the mails as is enjoyed by people abroad, but, as he naively says, the express companies opposed the idea so strongly that he was obliged to abandon it.

It is not unnatural that the express companies should oppose a plan for transporting packages by the mails at a small fraction of the rates which they demand for the same service; but there is something to be considered in the administration of a public office besides the interests of the express companies; and their opposition ought not to be regarded for a moment in comparison with the great benefits which would be conferred upon the people of the United States by such a postal service as, for instance, that of Germany. The greatest need of this country is, and will be for many years, cheap transportation. For want of this the California farmers are compelled every year to feed their pigs with hundreds of thousands of dollars' worth of fruit, worthy of the Gardens of the Hesperides, while the poor working people of Chicago and New York, to whom a Los Angeles plum or a Florida pineapple would be a taste of Paradise, must go without everything except the great staple articles, on account of the enormous cost of getting it.

In Germany, supposing it to be provided with such a varied climate as ours, the fruit grower would distribute broadcast in the cities return postal cards, containing blank orders for four, five, or six pound boxes of apricots, grapes, fresh figs, or oranges, which, on receipt of the slip, with money order, would be delivered by the next mail at the house of the consumer. Tons of fresh herrings, butter, and other articles are distributed daily in this way all over Germany, to the advantage of the fishermen and farmers, who find a sure market for the product of their toil, as well as of the citizen, who finds his tastes satisfied at a small cost, and of the public treasury, which can transport such articles profitably at a small fraction of express charges.—*Amer. Architect.*

Do Yous.

Do you take a squirt can in one hand and project a stream of oil as far as you can throw it, in order to save going to the hole itself?

If you do, don't do it any more. Willful waste is downright robbery.

Do you use an oil can at all for oiling, except on emergency, or for the moment?

If you do, don't do it any more, for much better lubrication can be had by automatic apparatus.

Do you keep an old tin coffee pot full of suet on the steam chest, and every time you have nothing else to do pour a dipperful into the steam chest?

If you do, stop it. Get a sight-feed cup, which will save you the labor of slushing the cylinder and save the cylinder and valve seats, the piston and follower, and all other places touched by the grease.

Do you feed up on the boiler until the water is out of sight in the glass, then shut off the feed, put in big fire and sit down in a dark corner with a four-horse brier pipe and smoke until you happen to think that may be the water is low?

If you do these things, you should notify the coroner that some day his services will be needed, but it is better to cease the practices mentioned before the coroner comes.

Do you stop leaks about the boiler as fast as they occur, or do you wait until the place sounds like a snake's den before you stir?

If you do, you waste heat, which is the same word as money, only differently spelled. Every jet of hot water leaking from a steam boiler is just so much money thrown away; and if it was your money, you would be bankrupt in a short time in some boiler rooms.

Do you take a screw wrench and yank away at a bolt or nut under steam pressure?

If you do, there will come a time, sooner or later, when you will do so once too often, and either kill yourself or some one else. Bolts and nuts are liable to strip or break if tampered with under pressure, and they never tell any one when they are going to do it beforehand.

Do you attempt to stop pounding in the engine by laying for the crank pin as it comes round and trying to hit the key once in a while?

If you do, ask the strap and connecting rod how it likes it, when you don't hit the key and do hit the oil cup.

Do you pack the piston by taking it out of the cylinder, laying it on the floor, setting out the rings, and then when the piston won't go into the cylinder, try to batter it in with a four-foot stick of cord wood?

If you do, you should reform, and pack the piston in the cylinder where it belongs, being sure to get it central by measuring from the lathe center in the end of the piston rod.

Do you put a new turn of packing on top of the old hard-burned stuff when the piston rod leaks steam?

If you do, you will have a scored piston rod and broken gland bolts some day. Packing under heat and pressure gets so hard that it cuts like a file when left in the stuffing box, and as soon as one begins to leak, all the old stuff should be pulled out and new put in its place.—*The Milling Engineer.*

Industrial Uses of Asphalt.

In view of the important extent to which asphalt is employed in connection with various industrial applications, the details communicated to the *Deutscher Bergwerksblatt* by Dr. Haussermann have a special interest at the present time. Asphalt (or bitumen) is generally understood to be a black pitchy substance of conchoidal fracture, fusible at a moderately high temperature, and remarkable for its peculiar odor, as well as its combustibility. Passing over the discussion of the external characteristics of asphalt and of its chemical properties, it is to a consideration of its technical uses that the author of the paper in question addresses himself, first laying down the distinction between artificial and natural asphalt. The latter is produced by the decomposition of organic substances, partly of antediluvian origin, principally consisting of carbureted hydrogens, more or less complex in their nature, and containing varying quantities of oxygenous or even nitrogenous ingredients.

This substance is sold in its natural state, or is obtained by melting certain bituminous rocks at the lowest temperature which will produce the desired effect. It is known according to its origin as Syrian, Dead Sea, Trinidad, Val de Travers, Bechelbronn, etc., asphalt; but two general divisions of natural asphalt are recognized, the Syrian and the American descriptions, the other kinds being of inferior commercial importance. The Syrian asphalt is distinguished from the American substance by its greater brilliancy and by its solubility. It is used for the best descriptions of lacquers, and has remarkable adhesive properties. American asphalt serves for application to iron, to protect it from atmospheric influences by a solid black coating. Where brilliancy is not required, the latter variety can, in all cases, replace the former. The Val de Travers asphalt is used for paving, mostly in combination with the artificial substance. Asphalt lacquer is produced by dissolving asphalt in turpentine oil or coal tar benzene. Continuous shaking at an ordinary temperature, or careful melting and strring, form alternative processes, but the latter requires care on account of the danger of fire. It is recommended to dissolve the asphalt and extinguish the fire before adding the essences required, and if the heating has not been too great there is no reason to fear excessive volatilization of the dissolvents. With a view to reduce the price of the lacquer (while scarcely lowering its quality), it is a common practice to add in melting the asphalt as much as 30 per cent of ordinary resin.

According to the nature of the substances thus employed, various kinds of lacquers are obtainable from the same asphalt. Turpentine oil is, however, the best admixture to prevent any undesirable odor, and to insure rapid drying. Of the various kinds of coal tar benzene, the purified colorless description, with a boiling point of 194° F. to 302° F., comes nearest to turpentine oil in the results obtained. For inferior qualities of lacquer, tar oils with a higher boiling point may be used, but a slow drying and unpleasant smelling composition is produced. These properties will not, however, in all cases be an objection. The easily flowing distillates obtained from crude petroleum (which are frequently known as benzenes) are unsuitable for the manufacture of varnish, as they only partially dissolve the resinous substances present. The so-called artificial asphalt is very extensively used, and is principally distinguished from the natural substance by its dull color and its scarcely perceptible odor. It is a product of the distillation of coal tar. The fluid distillate obtained in the manufacture of coal gas represents about 4 to 7 per cent of the quantity of coal used, and after about two thirds of its weight has been removed in the shape of fluid oils by fractional distillation, a residue is left which cools into a firm black substance, known as artificial asphalt or black pitch. The consistency of the asphalt varies according to the quantity of oil removed. One of the most important uses of this asphalt is for fuel in the shape of briquettes, small coal, sawdust, etc., being mixed with it. Asphalt pipes and flooring are also made from it, as well as lamp black of inferior quality. For the manufacture of lacquers, artificial asphalt is much less suitable than the natural substance, as the coating obtained is liable to crack, and is wanting in brilliancy.—*Industries.*

Ice Lenses.

The London correspondent of *Le Moniteur de la Photographie* writes to that journal that in the middle of the winter which has just elapsed a student made a lens of ice, with which he lit the pipes of some of the skaters on the Serpentine by means of the solar rays, an experiment, he says, which was first performed in the polar regions by Dr. Scoresby, to the great astonishment of the sailors, for they could not understand why the ice did not freeze the beams of the sun. We may remark that Professor Tyndall at times would set fire, at the Royal Institution, to a little heap of gunpowder with rays from the electric arc concentrated upon the powder by means of a lens of ice. His explanation was that, although ice absorbs rays of certain wave lengths, and is gradually melted thereby, other waves it does not absorb, and these latter produce the heating effect at the focus of the lens. It is wholly a question of the relative motions of the molecules of frozen water and the motions of the waves of light; when there is discord between the two, the discordant waves pass through the ice without absorption.—*British Journal of Photography.*

Discovery of the Bacillus of Scarlet Fever.

Drs. W. Allan Jamieson and M. Alexander Edington, of Edinburgh, announce, in the last *British Medical Journal*, the discovery of a specific bacillus of scarlet fever. The micro-organism has been isolated, cultivated, and put through its paces generally, coming out, apparently, with a specific character.

"The rapidity of the growth of this organism—which is such that, if one inoculate a flask of broth, the diameter of which is two and one-half inches, and it be incubated, the pellicle will develop and cover it entirely over in the course of four hours—suggests an explanation of the very short period of incubation in scarlet fever."

Dr. Edington, who carried out the bacteriological part of the work, has failed to show that pure inoculations of cultivated bacilli cause scarlatina in man; also, that the supposed specific bacillus is not found in other diseases.—*Medical Record.*

Home Industries.

It is clearly evident to most Americans that the advantage of this country lies in multiplying domestic industries, rather than in diminishing them. Every new industry that can be maintained, which supplies a want felt by the people, is a clear gain in every way, as employing workmen, keeping profits at home, using materials produced here, paying wages that are spent here, and tending to make us industrially independent. The very highest form of national life is that which exists with the widest possible diversification of industry. England suffers to-day because she has intensified her manufactures and neglected to cultivate her soil thoroughly. Ireland and India suffer because they have agriculture without manufactures. We give our people a chance in every direction, and so we possess the highest prosperity and the most robust national life.—*Textile Record.*

A New Relay.

A very simple and sensitive relay has been designed by M. Lahmayer, the construction of which will easily be understood from the following description:

A glass tube closed at both ends is about half filled with mercury, and contains a piece of iron rod nearly the full width of the tube, which floats in the mercury. A pair of platinum wires enter the glass just above the normal level of the mercury, and are connected with the circuit to be closed by the action of the relay. The glass tube is placed within a solenoid traversed by the current in the first circuit. The iron float is sucked down by the solenoid. The mercury rises and closes the circuit through the platinum wires. To avoid the oxidation of the surface of the mercury by the spark on breaking contact, the upper part of the tube is filled with nitrogen.

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Correspondence.

Diet of Strong Men.

To the Editor of the Scientific American:

On page 118 of SCIENTIFIC AMERICAN of Aug. 20, under the heading of "The Diet of Strong Men," you say: "The coolie fed on rice is more active and can endure more than the negro fed on fat meat."

This is not at all the case in the British colony of Demerara, on the northeast coast of South America. There, the coolies, who are imported from India, are the least robust of the three races employed as laborers. They are not at all muscular, and are employed in hoeing the crops and in similar light labor. The Chinamen, who are never called coolies there, are stronger, and they, too, are employed in the crops, and also in mechanical and general labor. But the heavy work, the digging of ditches, the handling of heavy timbers, etc., is always done by negroes. No planter will employ a coolie in such work, for his muscular strength is not equal to it, nor to any severe labor.

The coolie does not confine his diet to rice, nor the negro his to meat. In Demerara the chief food of the laborer is salt codfish and plantains. The coolie probably eats more rice and less meat than the negro, but in other respects their food is about the same.

G. ROBERTSON.

33 East 21st St., New York, Aug. 21, 1887.

Gigantic Oaks.

To the Editor of the Scientific American:

In the issue of the SCIENTIFIC AMERICAN of July 23, mention is made of a gigantic oak discovered in the bed of the Rhone, and now on view at the Havre exhibition. The dimensions are given as follows: Length, 101·6 feet; circumference at origin of roots, 29·5; circumference at level of the soil, 19·6. Our friends the Frenchmen must (seeing the labor they have been at) be proud of their oak, and at the same time ignorant of some of the huge oaks still growing and recently standing in England. Mention of a few of these may, perhaps, interest the readers of the SCIENTIFIC AMERICAN.

The largest oak now standing in England is the Cowthorpe oak, measuring 78 feet in circumference at the ground. Tradition says at one time the tree and its branches covered an acre of ground. I visited this tree a few years ago, and although quite hollow and its interior made to serve for a calf pen, some of its branches still have plenty of leaves and acorns.

A few miles from Cowthorpe stands a farm house. On the lawn stands a majestic oak, as to size and beauty such a tree as we seldom see in a month's walking tour. A certificate is kept in the farm house which states that the tree on the lawn was an acorn planted from "the big oak at Cowthorpe." Dates are given. The Parliamentary oak in Clipstone Park is supposed by the ancient chroniclers to be 1,500 years old. This park existed before the conquest (1066), and belongs to the Duke of Portland. The "tallest oak in England" belonged to the same nobleman. It was called the "Duke's walking stick," and was higher than Westminster Abbey. The "Three Shire oak," near Worksop, is so called because its branches stand in three counties—Nottingham, Derby, and York. Perhaps the most productive oak was that of Gelemos, in Monmouthshire, felled in 1810. Its bark was sold for $1,000 and its timber for $3,350. In the mansion at Tredegar Park, in Monmouthshire, there is a room 42 feet long and 27 feet broad, the floor and wainscot of which are the product of a single tree felled on the estate.

In Dr. Hunter's edition of Evelyn's Sylvia is a figure of the Cowthorpe oak already alluded to. About a mile and a half from Shrewsbury, there formerly stood an oak 44 feet circumference at the base, 27 feet circumference at 8 feet from the ground.

There formerly stood in Hainault Forest, near Barking, Essex, a tree called the Fairlop oak, 36 feet in circumference. Mr. Gilpin, in his "Forest Scenery," says that tradition says that the tradition of the country traces this tree half way up the Christian era. This tree was naturally the pride of the villagers in the district, and according to the annals of the neighborhood received its name of Fairlop in this way: The farmer on whose estate the tree grew wanted to lop off a branch. The villagers objected. The farmer, however, in lieu of the branch agreed to give the parishioners a bean feast annually. This was agreed to, and the annual fair was called Fairlop. This tree fell some years ago, and I think its wood was made into a pulpit. The fair was held until a few years ago, and still called Fairlop feast. As the site of the fair is only a few miles from London, it is fully patronized by the light-fingered gentry, card sharpers, and thimble riggers. The writer remembers visiting this fair some years ago. The finest "turn-out" on the road was the car of the licensed victualers. This was in the shape of a boat, and drawn by six horses.

The oak shown at the Havre exhibition is said to be 400 years old—a small age for an oak, as will be seen from the ages of those alluded to above. Some of the best poets have sung the praise of the oak, singing its usefulness and longevity. Dryden says:

> The monarch oak, the patriarch of the trees,
> Starts rising up by slow degrees.
> Three centuries he grows, and three he stays
> In state supreme, and in three more decays."

In these days of iron ships, armor-plated hulls, and steel yachts we are apt to forget the service done by our old wooden ships. Pope sang of the oak, saying:

> "Let India boast her plants, nor envy we
> The weeping amber and the balmy tree,
> While by our oaks the precious loads are borne."

K. Y. STEPHENSON.

PHOTOGRAPHIC NOTES.

Photo. Plates for Colored Objects.—1. For the production of colored objects (paintings) containing red, also views at sunset with yellow clouds, I recommend the azaline bath.

Azaline, solution in alcohol (1 to 2,500)	20 c. c.
Ammonia	2 "
Water	80 "

Bathe one minute and then dry. Exposure through aurantia glass (flowed with aurantia collodion with three per mille aurantia) three to four times as long as wet. Development as usual. These plates, with good emulsion, will keep for eight weeks.

2. For landscapes with much green and blue (water, moisture in the atmosphere), the erythrosin silver bath.

Erythrosin, solution in water (1 to 1,000)	50 c. c.
Silver solution (1 to 1,000)	50 "
Ammonia	2 "
Water	100 "

Filter. The plates are bathed for one minute and then dried. They will not keep longer than eight days, are twice as sensitive as the ordinary ones, and give also excellent results without the yellow glass, but they are not red-sensitive.

Developer.

SOLUTION I.

Sulphite sodium	100 grammes.
Pyro.	14 "
Distilled water	500 c. c.

SOLUTION II.

Carbonate sodium	50 grammes.
Distilled water	1,000 c. c.

Mix one volume No. I. with two volumes No. II.

—*H. W. Vogel, Anthony's Bulletin.*

Intensifying Negatives.—M. G. Cassebaum says that negatives can be evenly and vigorously intensified in the following way. First steep the plate in a faintly acid solution, then soak it in the following bath:

Nitric acid	part.
Water	960 parts.
Chrome alum	48 "

Rinse the plate well, then treat it in the following way. Prepare:

A.

Gallic acid	120 parts.
Alcohol	480 "

B.

Nitrate of silver	30 parts.
Water	480 "

Mix 30 parts of each of the above solutions, then add thereto 480 parts of water; cover the plate with the solution and leave it therein until the required density is obtained. Then wash.

Waxing Prints.—Dr. Eder gives a brilliant surface to prints upon albumenized paper by treating them with:

White wax	100 parts.
Dammar varnish	4 "
Rectified essence of turpentine	100 "

To preserve the solution it is put into a well-dried bottle, and when it thickens by evaporation a little more rectified turpentine is added.—*Revue Photographique de la Societe Francaise des Archives Photographiques, Historiques et Monumentales.*

Removing Silver Spots from Negatives.—The negative is soaked for five minutes in pure water, then in:

Iodide of potassium	1 part.
Distilled water	24 parts.

It is left in the above bath for about ten minutes. When the spots are old ones, the plate may be left in the bath for half an hour. It is next placed in a bath of:

Cyanide of potassium	1 part.
Distilled water	16 parts.

It is then carefully rubbed with a little cotton wool until the place formerly occupied by the spot is uniform in appearance with the rest of the picture. When the spots are very old indeed, the solutions may be stronger, and the plate left in them for a longer time.—*Photo. Rundschau.*

Bleaching Bromide Paper Prints.—Mr. F. C. Beach, in a paper read before the recent photographers' convention, Chicago, says: The following solution will bleach out either an unfixed or fixed bromide print in about five minutes' time. Continual movement of the solution over the surface materially helped the bleaching action.

Bromide of copper solution	½ ounce.
Hyposulphite of soda	100 grains.
Alcohol	1 ounce.
Water	2 ounces.

The alcohol is added to prevent the ink from spreading.

The bromide of copper solution is very easily made. The following is the usual formula. Make two solutions, as follows:

Bromide of potassium	120 grains.
Water	4 ounces.
Sulphate of copper	120 grains.
Water	4 ounces.

Mix the two and we have a bluish bromide of copper solution.

An English Provisional Patent Does not Antedate an American Patent of Subsequent Date.

Judge Acheson recently filed an opinion in the United States Circuit Court, Pennsylvania, in the case of Emerson, Smith & Co. *vs.* Ernst T. Lippert, on a plea to the bill of complaint.

The defendant in his plea denies the complainants' right to maintain their suit in equity against him because a patent for the same invention had been granted in Great Britain prior to the granting of the patent in the United States upon which suit is brought, and that the act of Congress under which the patent in suit was granted provides that no patent shall be declared invalid by reason of its having been first patented in a foreign country, provided the patent shall expire at the same time with the foreign patent, or if patented in more than one foreign country, it shall expire with the one having the shortest term.

James E. Emerson, one of the complainants, made application in the United States for a patent for an improvement in saws on May 31, 1871, and upon this application a patent dated February 6, 1872, for the term of seventeen years, was granted to him. On October 12, 1871, Joseph E. Holmes, as agent for Emerson, made application in England for a patent for the same invention, and filed in the office of the Commissioner of Patents of Great Britain a provisional specification, and a patent was granted to Holmes, sealed April 3, 1872, and dated October 12, 1871. The complete specification was filed April 12, 1872, the same having been subscribed by the patentee on March 22, 1872.

The act regulating the granting of English patents provides that the applicant for a patent may file with his petition either a provisional specification—simply describing the nature of the invention—or a complete specification. If a complete specification is filed, the invention is protected for a term of six months, and the applicant is clothed with like powers and privileges as if the patent had been issued. But where a provisional specification is filed, it is to be referred to the law officer, who, if satisfied, will give a certificate of allowance to be filed with the commissioner of patents, whereupon, for a period of six months, provisional protection is secured, and within six months after application, upon the warrant of the law officer, a patent is to be granted, and may be sealed and bear date as of the day of the actual sealing or any other day of application or date of sealing, provided a complete specification has been filed, but no proceedings at law or equity shall be had for infringement committed before the same was actually granted.

The question before the court was whether before the granting of the United States patent the invention had been patented in Great Britain, within the meaning of the 25th section of the Act of Congress of 1870.

The court holds that the invention had not been patented in Great Britain before it had in the United States. The filing of the provisional specification merely secured temporary provisional protection within the narrow limits of saving any patent to be thereafter granted from prejudice by reason of the intermediate use and publication of the invention. That before the sealing of the English patent Holmes was not invested with any of the rights or privileges of a patentee. Nor is it any moment that the English patent was dated as of October 12, 1871. That date was an arbitrary one, and gave to the instrument no retrospective operation, and the life of the United States patent, issued before the sealing of the foreign patent, is not to be abridged by the antedating of the latter. The plea is therefore overruled.—*From Pittsburg Chronicle-Telegraph, Aug.* 16, 1887.

Effects of Snow on Marble.

The results of the examination of snow taken from different places in Munich and its neighborhood, by Mr. Sendtner, says the *Pharmaceutical Journal* (London), would seem to indicate not only that snow has a considerable faculty for absorbing sulphurous acid from the atmosphere, but that the absorption goes on continuously for some time. Mr. Sendtner ascertained that, on one day when snow fell, sulphurous and sulphuric acids were present in it in fairly equal portions, but on the second day almost all the sulphurous acid had been ozonized to sulphuric acid. In the vicinity of chimneys and gas works the absorption would, of course, be greater. This great absorptive power toward sulphurous and sulphuric acids is considered of great practical interest, as explaining the destructive influence of snow upon marble statuary.

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SIMPLE PROCESS OF ENGRAVING GLASS AND METALS.

BY GEO. M. HOPKINS.

There are very many applications for an inexpensive and effectual method of etching or engraving glass in various forms, plain and plated metals, enameled surfaces, pottery, etc. Of all existing processes for accomplishing this work, the sand blast is undoubtedly capable of the most universal application. In point of effectiveness and in general usefulness it may never be surpassed, or even equaled; yet a substitute for it, even though incapable of as extended application, will find uses in the arts, and will doubtless be appreciated by amateurs.

Such a process is illustrated by the annexed engravings. The requisites for carrying out the process in its simplest form are: A pound of coarse emery, a pound of lead shot, a wooden box 10 or 12 inches long (a cigar box will answer for the experiment), some pieces of glass or metal, and some paper patterns or stencils. The box is provided with a clip at the back and a sliding clamp at the front for holding the plate to be engraved, and it may with advantage be furnished with a clamping device of the same sort at the upper end. The lid of the box must be provided with a packing strip of thick cloth or felt, to prevent the loss of emery.

The glass or metal to be engraved is cleaned thoroughly, and to secure the best effects it should be polished. A paper stencil of the desired form is fastened to the glass or metal plate by means of mucilage of good quality. The pattern should be made of thick writing paper, and care should be taken to see that every part of the paper is thoroughly attached to the plate. Any gum around the edges of the paper should be removed by means of a moist sponge. The exposed parts of the plate must be perfectly clean and free from streaks, otherwise there will be undesirable markings on the finished work.

When metal plates are to be engraved, they should be well polished before applying the stencil, to secure good contrasts. For coarse stencils and rough work, the shot should be large and the emery coarse, but for fine work moderately fine shot and finer emery are required.

After the plates to be engraved are placed in the box, the shot and the emery are poured in, the box is closed and the lid fastened, when the box is shaken violently endwise, causing the shot and emery to strike the plates at opposite ends of the box in alternation. The shot, in the operation of driving the particles of emery against the plates, become charged with particles of emery, as shown in Fig. 2. The emery becomes so embedded in the shot as to be permanent, and a number of shot thus armed, together with loose emery, soon abrade the surface of the metal or glass wherever it is unprotected by the paper, and produce a fine matted surface, which contrasts strongly with the polished parts of the surface protected by the paper. After roughening the unprotected parts of the plate, the paper stencil is soaked off and the plate is dried, and in case it is metal it is lacquered.

Symmetrical stencils, which answer a very good purpose, may be made by cutting paper folded in various ways. Lace may be employed as a stencil, and where only slight etching or engraving is required, the pattern may be produced in varnish.

To adapt this method to engraving articles having curved or irregular surfaces, the box is left open at the lower end and provided with a flexible sleeve of soft rubber. The articles to be engraved are held against the sleeve by leather straps. Designs of various kinds may in this way be permanently delineated upon the glass and metal ware, and upon small panes of glass for ornamental windows, for lamp shades, etc. Mirrors may be provided around their edges with leaves and flowers, and metal panels may be prepared for various kinds of ornamental metal work.

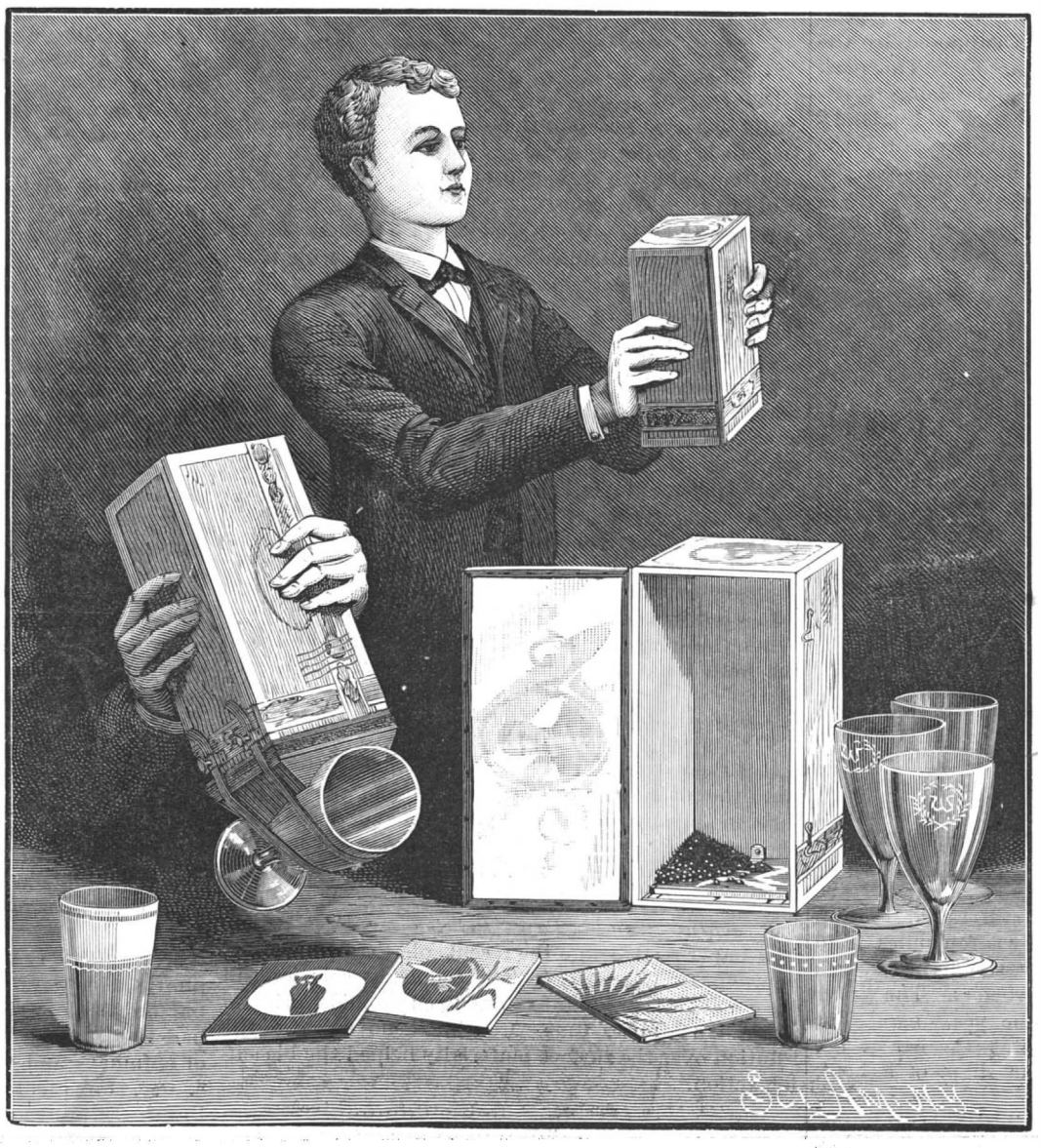

Fig. 1.—SIMPLE METHOD OF ENGRAVING GLASS AND METALS.

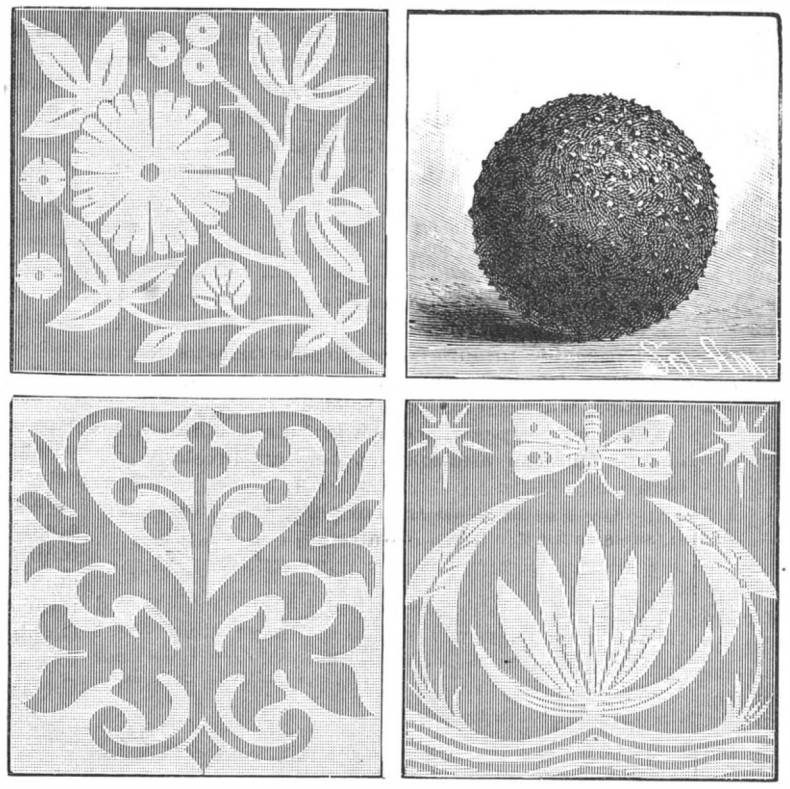

Fig. 2.—SHOT MAGNIFIED, SHOWING EMERY EMBEDDED—EXAMPLES OF ENGRAVING.

Cure of Whooping Cough.

The author has found that fumigation with sulphurous acid will frequently succeed in immediately arresting whooping cough. His methods consist in having the child dressed in entirely clean clothes in the morning and removed from the apartment; then, in the sleeping room, as well as the other rooms occupied by the patient, his bed clothing, clothes, toys, and everything which is washable should be hung up; then sulphur should be burned in the rooms at the rate of twenty-five grammes for each cubic meter of space, and the rooms should remain closed and subjected to the fumes of the sulphur for five hours. Then everything should be aired, and at night the child should be put to bed in his room, which is thus completely disinfected. Nothing else is requisite, and even in rebellious cases the effect of this disinfected atmosphere will be found to be effective.—*A. F. C., Archives of Pediatrics; Mass. Med. Jour.*

The Sidon Discoveries.

The *London Times* gives this summary of the Sidon discoveries, as to which American missionaries have already sent home some details: 1. The chamber of the eastern side of the square excavation (which is truly orientated) contained two sarcophagi in white marble. One of these is perfectly plain and the other is ornamented with sculptures of the richest and most beautiful kind, already roughly described. This is the chamber which is surrounded by an arcade adorned with eighteen mourning figures in relief, dressed in Greek costume, each in a different pose. It is not stated whether the arcade itself or any portion of it has been removed. 2. The south chamber had two sarcophagi, one in black marble, plain, and the other in white, with splendid sculptures. 3. The western chamber had one sarcophagus in white, mummy shaped. But this chamber proved to be the vestibule to another containing four sarcophagi, one of which was the richest and finest of all those found. The walls of this chamber also are richly decorated. 4. The chamber on the north has two plain, mummy shaped sarcophagi. On removing the debris which covered the ground two other chambers were found, one on either side, on a lower level. One of these contained a small tomb; the other, four white marble sarcophagi. Under the eastern chamber also was found another containing a sarcophagus of black stone, in which were the teeth, bones, and hair of a woman. All these tombs had been violated by breaking a corner of the coffin lid. But in carrying out the works for the removal of the sarcophagi, a chamber was found in which at first nothing was remarked but two fine bronze candelabra, each about five feet in height. The flooring of this chamber, however, on examination, proved to consist of a bed of great stones laid with the utmost care. Beneath these were a second bed of stones, and then a third, and, under all, thus carefully covered up and hidden away, a great monolith covering an opening in the rock. In this deep chamber was found a splendid sarcophagus in black stone, resembling that of the King Eshmunazar in the Louvre. It was also, which is more important, provided with an inscription in Phœnician, eight lines in length. The inscription has not yet reached us. In the *Badieï* (published once a week at Beyrout, in French and Arabic) a translation is proposed, which is copied for what it is worth; probably considerable modifications will be made in it when the inscription is in the hands of scholars: "I, Talnite, Priest of Astarte and King of Sidon, son of Eshmunazar, Priest of Astarte and King of Sidon, lying in this tomb, say: Come not to open my tomb. There is here neither gold nor silver nor treasure. He who will open this tomb will have no prosperity under the sun, and shall not find repose in the grave."

There seems to have been little else of importance found in these chambers; some gold buttons, a coin or two, collars, rings and bracelets, two bronze candelabra, and some terra-cotta lamps exhaust the list so far as can at present be learned. Something, however, will doubtless have to be added; and it is, meanwhile, interesting to note that his Excellency Hamdi Bey proposes to recommence operations in the early spring of next year.

To Bleach Sponges.

First wash well in cold water; then immerse in a bath composed of 2 drachms of permanganate of potash and 1 ounce of strong sulphuric acid to the gallon of water. The duration of the immersion varies according to the size of the sponge, etc.

To obtain the color so much admired, wash well in soda water, then immerse the sponge in a solution of carbonate of potash (4 ounces to the gallon) until you have hit the color, then wash and dry.

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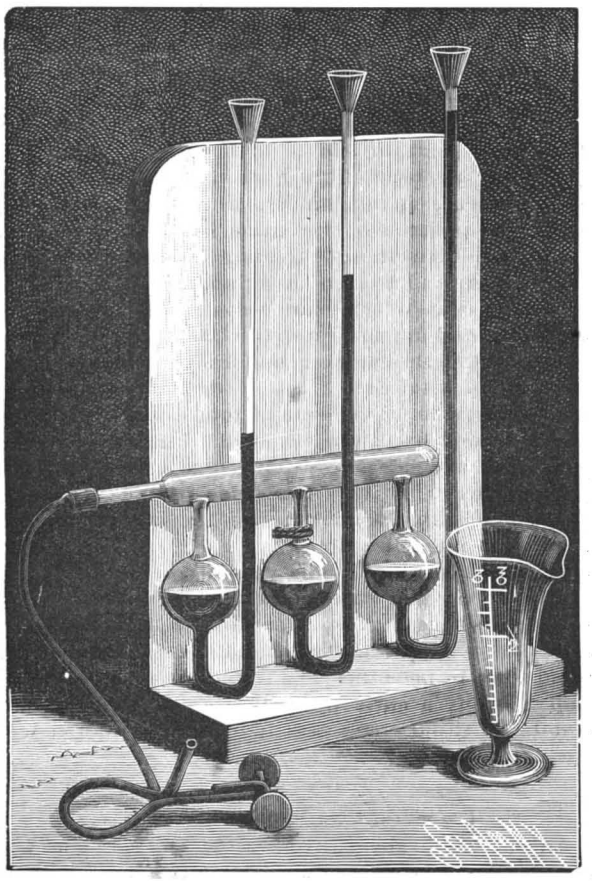
THE YACHT THISTLE.

This new yacht, constructed in Scotland with a view to competing for the world's prize cup, now held in New York, arrived at this port on the 16th of August, 21 days from Gourock Bay on the Clyde, whence she sailed July 25.

The vessel attracts much attention, and opinion is about evenly divided as to whether she will be able to



THE EQUILIBRIUM OF COLUMNS OF LIQUIDS OF DIFFERENT SPECIFIC GRAVITIES.

beat the Volunteer, the new yacht with which it is expected to compete for the great prize in October next.

We give from the *Graphic* several views of the Thistle as she appears in different positions. These are from photographs, and in connection with the large engraving given in the SCIENTIFIC AMERICAN of July 2 last, will give a fair idea of this remarkable vessel. In nearly all of the several races the Thistle has sailed in England she has been the winner. The following shows the dimensions of several of the fastest yachts, as given in the New York *Tribune:*

	Thistle.	Volunteer.	Mayflower.	Galatea.	Priscilla.	Atlantic.	Puritan.	Genesta.
Length over all....	112	107	100	100·6	95	95·1	93	96·5
Length on w. line..	85	85·10	85	86·10	83·3	83·4	81·1	81·6
Beam.....	20.3	23	23·6½	15	22·8	23·10	22·6	15
Beam at w. line.....	20	22	22·3	15	22·2	23·2	21·6	15
Depth of hold.. ...	14·2	10	10	13·3	9·4	10·6	9·6	11·9
Draught.....	13·8	10	10	13·6	9	9·10	9·3	13
Area mid sec.....	15	96	92	125	92	102	88	115
Mid section bow...	.....	0·60	0·60	.....	0·60	0·64	0·58	.....
Mast, d. to hou.....	62	65	63	53	61·9	63	60	52
Topmast	45	48	46	47	48	48	44	44·6
Boom.....	81·6	84	80	73	80	78	76	70
Gaff	50	52	50	45	48	48	47	46
Bowsprit outb.....	38·6	37	38	36·6	39·7	38	38	36.6
Spinnaker boom ...	70	70	67	65·6	66	70	65	64
Displacement	135	116	110	157 6	115	120	102·5	140
Inside ballast.....	10	10	14	6	47	15	12	5
Keel ballast.....	55	50	37	72	.....	47	32	68
Sail area.....	.....	9,000	8,634	7,505	8,500	8,100	7,370	7,150

APPARATUS FOR ILLUSTRATING THE SPECIFIC GRAVITY OF LIQUIDS.

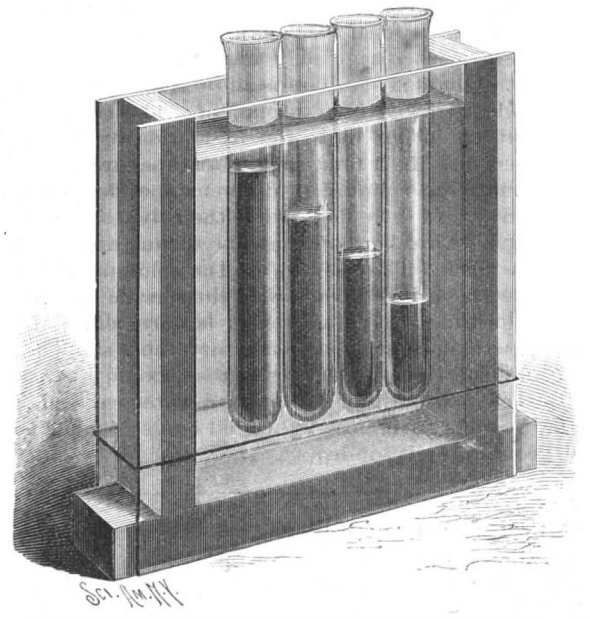
BY T. O'CONOR SLOANE, PH.D.

The law of the equilibrium of communicating columns of liquids of different specific gravities is that their height varies with their specific gravities. Thus a column of mercury one inch in height will sustain a column of water over thirteen inches high. This can be very easily illustrated by a bent tube, of the shape of the letter U. A little mercury is poured into the bend, so as to fill it. Then if water is poured into one limb it will rise thirteen times as high as the mercury, both measurements being referred to the surface of the mercury under the water as a base. Other liquids can be substituted for mercury. Although they may tend to mix with the water, the diffusion is so slow that the experiment can be performed with some satisfaction.

This arrangement is only adapted to show the experiment with two liquids. An apparatus is shown in the cut by which the same is illustrated for three liquids. The same apparatus can be made to show it for any number.

The glass portion is made in one piece. The horizontal tube may be one-half inch in diameter, the small bent tubes one-eighth inch internal diameter, and the bulbs, in this case, should then be at least one inch in diameter. The tubes from bend to top should be about seven inches long. This gives a small apparatus. With advantage it could be made very much larger. The great point to be kept in mind is that the bulbs should be eight or ten times the internal diameter of the tubes. The whole may be mounted on a simple wooden stand. One end of the horizontal tube is closed; the other is provided with an open extension of diminished size, so as to receive an India rubber tube. A pinch cock for closing the latter is provided.

Liquids of different specific gravities are now poured into the respective tubes. The upper ends of the latter are slightly expanded, so as to form little funnels. Enough liquid is poured into each to rise to or slightly above the center of the bulbs. The pinch cock is now opened and the experimenter blows into the rubber tube. The liquids at once rise in the tubes and sink in the globes. This rising and sinking is in exact proportion to their specific gravity. Owing to the large size of the bulbs, they sink in them very little compared to the amount they rise in the tubes. The effect of this is that in the bulbs they preserve almost an exact level with each other. But in their rising they vary widely.

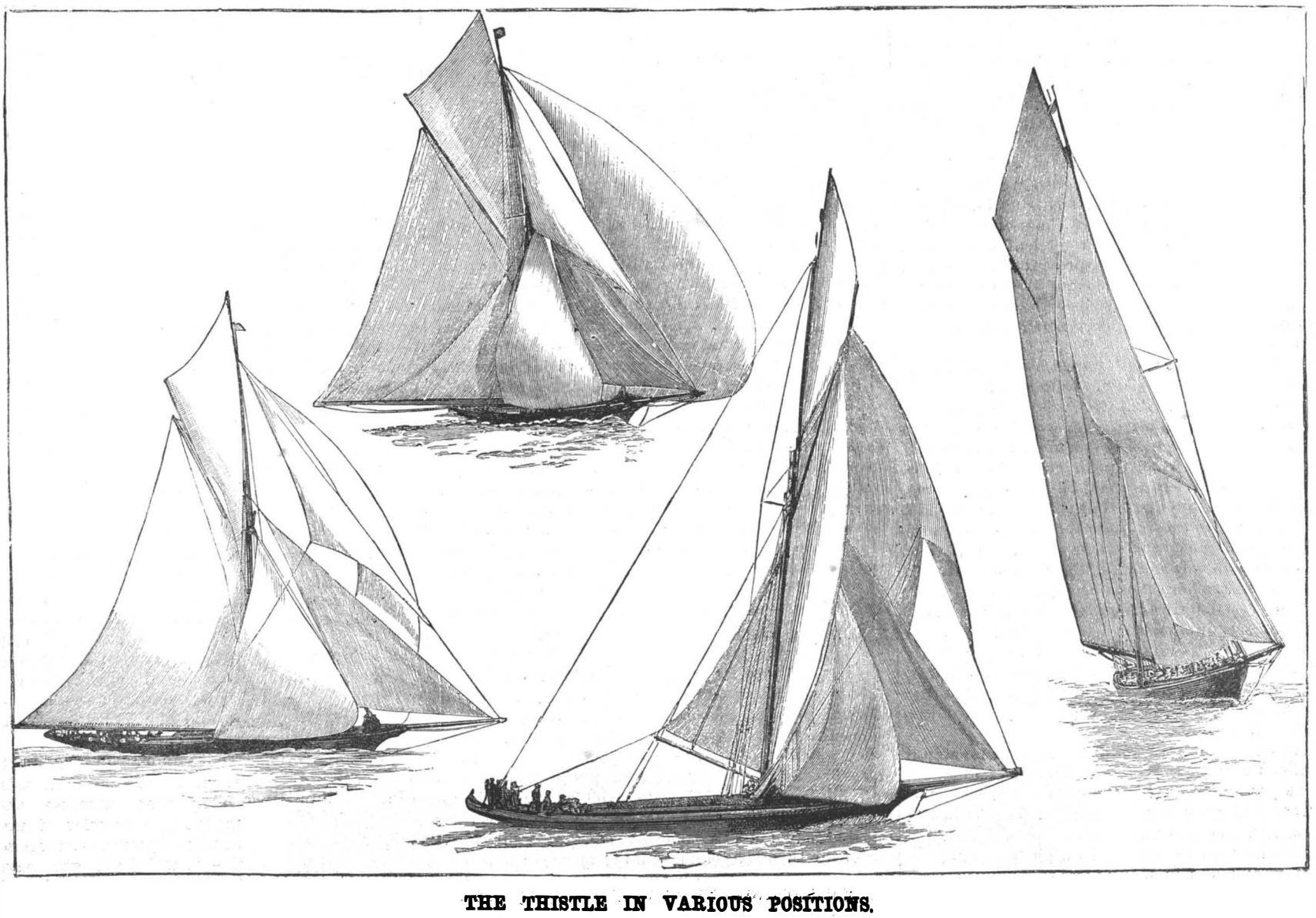


FLOTATION OF LIQUIDS OF DIFFERENT SPECIFIC GRAVITIES.

As soon as the lightest liquid reaches the top of the tube, the pinch cock is closed. Then the different columns remain stationary, all exerting the same pressure, though of different heights.

Concentrated sulphuric acid may be used as the heaviest liquid. It has a specific gravity of 1·84. By diluting it with varying amounts of water, lighter liquids may be produced, and water may serve for the other extremity of the scale, or alcohol may be used as a still lighter fluid. If a heavier fluid is desired, a solution of boro-tungstate of lime or of iodide of mercury in iodide of potassium may be used. The first of these may be made 3·6 times as heavy as water.

By making the apparatus smaller it will afford an excellent lantern slide. In this case it should not be mounted on a board, as shown in the cut, but may be held in a clamp or even in the exhibitor's hand in front



THE THISTLE IN VARIOUS POSITIONS.

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of the condensers. While any number of tubes may be thus connected, it is as well not to have more than four or five, as the preparation of so many solutions of varying density involves some little trouble. To make it more effective, some coloring matter should be used in the fluids, and this should be made to vary in intensity as the fluids vary in weight.

In the next cut another experiment, illustrative also of the laws of the specific gravity of fluids, is shown. With two pieces of glass and some strips of wood a water-tight cell is constructed. The wooden strips may be printer's "furniture." A three-sided frame is made, and cemented at the joints with sealing wax. The sides of the wood are then coated with sealing wax and one piece of glass put in place and exposed to a very gently applied heat. When the wax is thoroughly melted the glass is allowed to cool, and the other side is treated in like manner. The cell should be about five inches high and four wide by internal measurement. In it four or five test tubes are floated, each containing a liquid of different specific gravity. They are adjusted to float with their bottoms on an exact line. A rubber band may be sprung around the cell as a mark. The heights of the columns of fluid contained by each will vary with the specific gravity.

This forms an exceedingly good lantern slide. The two experiments are complementary, and should be shown in succession. The test tubes should fit freely in the cell, and nothing lighter than water can well be used in any of them, as a light fluid tends to make the tube containing it top-heavy.

A Transformation of Light into Electric Energy.

Instances of the indirect transformation are not new to the physical investigator, and a record of one of the first is to be found in the now classic work on the correlation of the physical forces written by W. K. Grove (now Justice Grove) when he was a young man. Special interest, however, attaches to some recent experiments by Kalischer, in which he describes a selenium cell which, when exposed to light, gave a permanent electric current.

Before quoting the abstract of Kalischer's paper that appears in the *Journal of the Chemical Society*, we may say a fewwords in explanation of the nature of the physical organism known as a selenium cell. The selenium cell consists essentially of two conducting wires separated by selenium, and it has long been known that when such an organism is placed in an electric circuit, exposure of the selenium to light means a diminution of resistance, or, in other words, that selenium conducts electricity better when exposed to light, and in some sense this increase of conductivity is proportionate to the intensity of the light. Indeed, several proposals have been made to practically use a photometer based on this action of light on selenium.

In practice, the selenium cell consists of two metal wires coiled side by side on a cylinder of glass or other non-conductive material, care being taken that the two wires, though very close together, do not actually touch. A thin film of selenium is then melted over the whole, so that it runs into the interspaces between the wires, after which the cell is exposed to such a heat as shall bring the selenium into the best condition of sensitiveness.

Since the telephone has been a recognized instrument, Graham Bell has pointed out that when a selenium cell is exposed to rapidly recurring impulses of light, corresponding impulses of electricity circulate through the connected wires of the selenium cell; and special interest attaches to the present observation of Kalischer, as it may be one element in a train of discoveries which may lead to such a complete transformation of light into electric energy as shall be of practical advantage to mankind.

The abstract of Kalisher's paper, as we find in the organ of the Chemical Society, is as follows:

About the same time that Bell discovered that an intermittent exposure to light generated a current in selenium which affected the telephone, the author met with a selenium cell which, under the action of light, produced a current which could be detected by a galvanometer. As it appeared that those who have paid special attention to the preparatipn of selenium cells have seldom met with cells which were so sensitive to light, an attempt was made, in the first place, to discover the pr per mode of making such cells.

The cell consisted of two parallel wires wound round a stem with selenium melted between them. In order to insure the sensitiveness of the cell to light, it was heated to 190–195°, kept at this temperature for half an hour, and then allowed to cool for an hour. If at first not successful, a repetition of the process produced the desired result.

When such a cell is inserted in a galvanometer circuit and exposed to the action of light, there is a permanent deflection. It is found that the cells which are sensitive have a large specific resistance. To produce a current in general, a very intense source of light is necessary. The sensitiveness, and with it the specific resistance, were found in many cases to diminish with the time. The author believes that these facts are very well explained by the hypothesis advanced by Siemens, that there is a metallic modification of selenium.

Again, if a cell is placed in an arm of a Wheatstone's bridge and the balance obtained in the usual manner, on allowing light to fall for an instant on the cell there is a deflection, but the mirror does not return to its position of rest at once, and gradually creeps up to a fixed position. This is not due to the effect of heat, for it occurs even when the cell is shielded by an alum cell or by a current of water circulating round it.

It is proposed to call this phenomenon after-action, from the analogy it presents to other well-known physical facts. The analogy is traced out by showing that the after-action is dependent on the duration and the intensity of the illumination of the cell. It is also shown to be independent of the direction of the current.—*Photo. News.*

Dangers of Benzine.

Some weeks ago, in a Philadelphia music printing establishment, while a boy was engaged in cleaning a press with benzine, rubbing it with a rag, the fluid blazed up; the lad's clothing caught fire, and he was so severely burned that his recovery was stated to be doubtful. It has been popularly supposed that flame, or at least a temperature equal to the white or red heat of iron, was necessary to ignite benzine vapor, but, according to the *American Exchange and Review*, this is a mistake. "It is a fact little known," says that journal, "that hard friction can develop sufficient heat to inflame benzine vapor, especially if the surface rubbed be varnished with shellac. We are informed by a competent and truthful mechanical engineer that a few years ago, while trying with benzine, in a closed tin vessel, to construct a thermostat to ignite a powder giving out sulphurous gas in case of fire outbreak, he found that the vapor was leaking from a minute crack in a seam. He requested a tinman to solder the leak, supposing that a copper soldering tool at dark heat would not be dangerous. To his surprise and that of the workman, the vapor ignited, with a blue flame, as soon as the tool approached near the crack, and a flame played around the tool like a will-o'-the-wisp. This gentleman several times experimented afterward, and found that at a dark heat the tool did not inflame the vapor when at a distance of twelve inches from the crack, but did always set fire to it if within six to four inches. No matter how small the crevice, there always came out enough vapor to ignite at this low degree of temperature. In these trials, as in the first instance, the tinman's furnace was kept at a considerable distance." We mentioned a few months since a case in which this vapor was ignited by electricity generated in rubbing a flannel garment, which was being cleaned in a tub of the fluid. This last occurrence once more emphasizes the need of the utmost caution in the handling of benzine in the scouring and furniture establishments and printing offices in which it is so generally and extensively made use of.—*Fire and Water.*

A Green Lake Color.

Uranium oxide forms a green lake with the coloring matter of cochineal. This property may be utilized for giving the determination of phosphoric acid by uranium nitrate increased accuracy and precision. The preliminary operations are supposed to be conducted according to Joulie's citro-uranic method, *i. e.*, solution of the phosphate in hydrochloric acid, precipitation of the phosphoric acid by means of the citro-magnesian solution, and solution of the double ammonium magnesium phosphate in dilute nitric acid. At this point the author adds to the nitric liquid a few drops of infusion of cochineal (obtained by treating the cochineal with boiling water), and then, with a pipette, ammonia slightly diluted until a violet color is obtained. This is made to disappear again by acidulating slightly with nitric acid. The liquid is then heated to 100°, 5 c. c. of the acid solution of sodium acetate are added, and the standard solution of uranium nitrate is then dropped in with a burette. Each d op of the uranium nitrate produces a greenish blue spot, which becomes gradually stronger as the end of the precipitation is approached, and which disappears on stirring as long as this precipitation is not complete, leaving the rose color of the cochineal. At the exact moment when the precipitation is complete the liquid takes a bluish green color, which undergoes no further change on the addition of a further quantity of uranium nitrate. —*C. Mallot, Moniteur Scientifique; Chem. News.*

Artificial Production of Pilocarpine.

Messrs. E. Hardy and G. Calmels have succeeded in effecting the synthesis of pilocarpine. In a paper read before the French Academy of Sciences, they gave a full description of their process, which consists of two steps, first the transformation of pyridino-lactic acid into pilocarpidine, and secondly the transformation of pilocarpidine into pilocarpine. As the method is complicated, and must be expensive, since gold chloride is one of the chemicals employed, the new synthesis is no doubt important scientifically, but cannot be said to be a practical process.

Do Inventions Decrease Wages?

Among the men who are prominent agitators in industrial lines are many who explicitly assert that inventions and improvements in machinery are responsible for the decrease in wages so much talked about nowadays. The assertion is of course easily disproved by the fact that in comparison with wages in the old days before machinery came into general use, the wages of mechanics are higher in these days of machines of the highest excellence. The Illinois Central Railroad publishes a record of locomotive service for thirty years which has a strong bearing on this point. According to that record, which is given in *The Milling World*, the running cost for a mile has fallen from 26·52 cents in 1857 to 13·93 cents in 1886. This reduction has been effected wholly by inventions and improvements in machinery. But the figures show that the progress of invention has been even more remarkable than these figures imply, because the wages of engineers and firemen have risen in the same period from 4·51 cents to 5·52 cents per mile run. In 1857 the engineers and firemen received 17·201 per cent of total cost. In 1865 the engineers and firemen received 15·091 per cent of total cost. In 1867 the engineers and firemen received 20·865 per cent of total cost. In 1886 the engineers and firemen received 39·627 per cent of total cost. Demagogues may dispute these figures, adds our contemporary, but it is nevertheless true that improvements in machinery, not only in railroads, but in other important lines as well, are a benefit in every way to everybody concerned. The general public are better served at cheaper rates, and the mechanic receives increased wages. Those peculiar individuals who advocate a return to "good old times," who prefer hand work to machinery, and who preach that invention is really a curse to labor, should try to understand the situation. Cases like the one quoted will open their eyes.—*The Milling World.*

Shall we Plant Native or Foreign Trees?

An editorial in the September *Century* closes as follows: "We feel justified in adding to these general statements a word of strong recommendation in favor of native as against foreign, or at least as against European, trees. At the best, the latter are uncertain in almost every case, while the former have an inborn and a well-proved title to be trusted. The most successful ornamental planting that has ever been done in America shows its results in the streets of such towns as Stockbridge, Great Barrington, Salem, and New Haven, and was the work of men who went to the forest and not to the nursery for their infant elms and maples. Certainly our more recently planted parks offer small promise of a like maturity of beauty with their European oaks and ashes, their Scotch and Austrian pines, in almost as deplorable a state as their Norway spruces. When not ornamental but economic plantations are in question, past experience tells very strongly against European trees, while the evidence of recent experiment with native trees—as in the plantations of indigenous conifers in Eastern Massachusetts—is of the most encouraging kind."

Concrete Forts.

We see that experiments are to be made shortly at Lydd as to the capabilities of a concrete turret to resist the impact of modern projectiles. A concrete tower is to be erected and covered with thirty feet of earth. We described a short time ago what a scientific French general had recommended as the fort of the future. This was an oval fort of concrete, shaped like a dish cover, without a ditch or flanking works of any kind, and having a thickly plated iron cupola in the center, armed with two or three heavy guns, and with disappearing turrets for quick-firing guns. These masses of concrete are pretty nearly solid, covering subterranean barracks and store rooms, and they would require very small garrisons. We believe the Belgian defenses on the Meuse will partake something of this character. The heavy guns are placed in pairs parallel to one another in the turrets, and are turned away from the enemy when loading takes place—*Broad Arrow.*

Natural Gas in 1827.

In 1827 there lived in Washington County, Pa., a farmer by the name of McCook, an uncle, says the Pittsburg *Times*, of the famous General Anson G. McCook, the present Secretary of the United States Senate. McCook's farm was situated on the old national pike, eight or ten miles out of Brownville. In attempting to dig a well a short distance back from the pike he struck a large flow of natural gas. This by accident became ignited, and the flame it gave forth scared the horses passing on the pike, and many runaways occurred. This went on for some time, until the authorities in that section passed an ordinance stigmatizing it as a nuisance, and compelling McCook to suppress it as such, which he did. Thus what the citizens of Pittsburg now consider the greatest discovery of the nineteenth century, just half a century ago the citizens of Washington County considered the greatest nuisance.

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The Meeting of the National Electric Light Association.

The sixth meeting of the above association was held in Boston, Mass., on August 9, 10, and 11. It was pronounced the most important meeting yet held, as it was the most numerously attended.

The president was Mr. J. Frank Morrison, of Baltimore, Md., who called the meeting to order at 10:30 A. M. of the first day. The place of meeting was the Parker House. In a brief address he reviewed some features of the progress of the last six months, and alluded to some of the promised papers to be read before the meeting. At the conclusion of his remarks he introduced Mayor O'Brien, of Boston. In brief but very felicitous remarks he welcomed them to the city. He noted the field for work they could find there in running street cars or small motors. Boston, he stated, had neglected small industries, and in electricity might be found the means of building them up.

The first business done was the presentation of the report of the legal committee on patent legislation. The report was presented by Mr. Arthur Steuart, of Baltimore. Its general tenor was in the direction of suggesting more thorough work by the Patent Office, so that the verdict of the office in granting a patent might be accepted as in some sense a guarantee of its legal force, so as to diminish litigation. The needs of the office in the way of a laboratory and of apparatus were also spoken of. The tenure of office, particularly of the commissioner, was declared unsatisfactory. While taking these and other somewhat radical views, a resolution was presented. The members were exhorted to use their influence with Congress to have it passed at the next session. This resolution provides for the appointment by Congress of a commission of three members, at an annual salary of $5,000, to study the requirements of the patent law, and to report thereon to Congress. The commission is to present to that body a draught of an act embodying what they shall decide to be desirable changes. Of this proposed action we shall speak elsewhere more at length. This report was followed by the report of the legal bureau, also presented by Mr. Steuart, its custodian. He announced that in the near future he hoped to be able to offer to the members the use of an analytical digest of patents and of the literature of electric lighting. The object of the proposed digest is to enable members to form some estimate of the scope and validity of new patents. Thirty-three serial publications were mentioned as drawn upon for this purpose. Mr. A. J. De Camp, of Philadelphia, presented the report of the committee on revision of the constitution. After discussion, the report was recommitted for the present. The report of the Committee on Wire Gauge was presented by Mr. A. V. Garratt. The difficulties of the subject were recapitulated both in the report and in the discussion which followed. A large table, entitled "Mathematical Properties of the Metric Wire Gauge," was presented in connection with it. This really valuable piece of work represents an immense amount of labor, embracing wire of diameter from 0·1 millimeter up to 10 millimeters, advancing by single tenths; in B. & S. gauge from No. 38 to 000. Eighteen columns of different factors and equivalents are given, both foot and pound as well as metric references being provided for.

The Committee on Proper Insulation of Wires and Proper Installation and Construction of Plants presented a preliminary report, followed by their resignations, as no funds were available for bringing the work to a conclusion. Mr. M. M. M. Slattery, of Woburn, Mass., then read the report of the Committee on Electrical Distribution by Alternating Currents. This, as our readers know, is one of the last developments in electrical engineering, and in the paper and discussion which followed its reading some very interesting points were brought out. One conclusion that would be considered rather remarkable was that shocks from alternating current were less to be dreaded than those from direct current machines. They tend to throw the person shocked away from them, and the burn is far less severe than that due to a direct current.

Electrical education was treated in a paper read by Mr. E. R. Weeks, of Kansas City, Mo. The Electric Light Outfit of the New Government Cruisers, by Lieut. J. B. Mudoch, U. S. Navy Electrician at the Torpedo Station, Newport, R. I., was a carefully prepared essay, stating the difficulties and conditions of the problem, and appealing to the electric engineers of the country to assist in its solution. Low-speed dynamos, coupled directly to their engine, were advocated. The use of the current for driving motors to actuate the loading machinery, etc., about the guns was recommended also. Several tables of dynamo constants, giving watts produced per pound and per square inch floor space by dynamos of different makers, were embodied in the paper.

Other papers were: On Bending Test of Wire and on Silicon Bronze Wire, by Dr. Leonard Waldo, of Yale College; on The Present Status of the Storage Battery, by Mr. C. O. Mailloux; and on Storage Batteries for Locomotion, by Prof. A. Reckenzaun.

The meeting finally adjourned on Thursday afternoon. Various social gatherings, excursions, and receptions by the Boston Electrical Club and other organizations characterized the progress of the meeting.

ON A MAGNETIC BRIDGE OR BALANCE FOR MEASURING MAGNETIC CONDUCTIVITY.*

BY THOMAS A. EDISON.

Perhaps no electric measuring instrument has proved more useful in practice, especially if we consider the various forms which it has assumed, than the device contrived by Christie and commonly known as Wheatstone's bridge. It was with the belief that a similar instrument could be constructed which should perform the same service for magnetic measurements, that the experiments were made the results of which I have the honor now to present to the section.

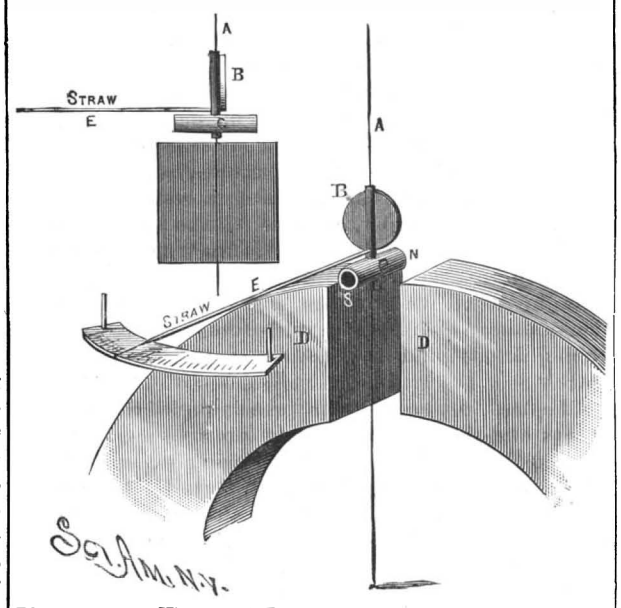

Fig. 2.—EDISON'S MAGNETIC BRIDGE—ENLARGED VIEWS OF MIRROR AND NEEDLE.

The Wheatstone bridge is based upon the fact that if two points of different electric potentials are united by two conducting paths, the fall of potential along these paths is absolutely the same, provided that these paths are absolutely alike electrically. Consequently, if two points equidistant from the place of higher potential be connected together, no current will flow through the connecting wire. So, by analogy, if two points be maintained at a constant difference from one to the other through two or more paths the magnetic potential will be absolutely uniform in all, provided these paths be magnetically identical. Hence, at any two points equidistant from a given terminal, the magnetic potential is the same, and these points would be without differential action upon a magnetic pole.

The magnetic bridge may be constructed in the form of a rhomb, the typical form of the Wheatstone bridge. For this purpose the four sides are made of the purest Norway iron, as soft as possible, and thoroughly annealed. To the acute angles of the rhomb are connected the poles of a long U-shaped electro-magnet, whose function is to develop the desired magnetic potential difference at these points. Connected to the two obtuse angles, and projecting inward, are two bars of Norway iron similar in section to those forming the sides. Their inner ends, which are hollowed out, approach to within about a half inch of each other. Between these ends a stirrup is suspended by means of a silk fiber, which stirrup carries a short needle consisting of a thin tube of hardened steel well magnetized. To the stirrup is attached either a pointer moving over a graduated arc or, better, a mirror by means of which the deflection can be read in the usual way with a lamp stand and scale.

In the instrument now in use in my laboratory, the magnetic bridge is in the form of a rectangle, the ends or poles of the electro-magnet being connected to the middle of the short sides, while the bars which pass inward to the needle are joined to the middle of the longer sides. The four halves of these longer sides constitute the sides of the bridge. The two at one end of the rectangle are fixed, the two at the other end are movable. The two bars which pass inward to the needle are curved so as to form a semicircle standing above the plane of the rectangle. The needle itself is similar in construction to that above described, but is suspended by a wire attached to a torsion head. A photograph of this apparatus I have the pleasure of exhibiting to the section.

It will be readily seen that when the electro-magnet is charged, a constant difference of magnetic potential is maintained at the two ends of the rectangle, so that if the four bars constituting the sides of the bridge are magnetically identical, there will be no difference of magnetic potential between the ends of the bars which pass to the needle, and hence there will be no deflection; but if one of the movable bars be loosened, the needle is at once deflected, and in a direction depending upon the side the bar occupies. If the bar be entirely removed, the deflection is a maximum of course. And if it be replaced by another bar differing in cross section, in quality of iron, or in any other way which affects the magnetic conductivity through the bridge, the deflection shows at once the amount of difference between that bar and the original one taken as a standard. The instrument is extraordinarily delicate, and the principal difficulties encountered in using it have arisen in the attempt to preserve this delicacy while at the same time the range of the apparatus is maintained.

The magnetic bridge was devised for the purpose of testing readily the quality of the iron purchased for the construction of dynamos. Very great variations are observed in irons supposed commercially to be of the same quality. Consequently, the potential difference developed by a dynamo having field cores of such iron can never be exactly calculated. But by comparing the iron which is to be thus used, in the magnetic bridge, its exact value for dynamo purposes may be determined, and the constants of the generator thus accurately calculated in advance.

But this bridge, it would seem, will be equally useful for testing iron and steel for other purposes. By its means, not only may the character and quality of the metal be ascertained in terms of any desired standard, but flaws in the interior of a bar, such as a car axle, may be discovered at once.

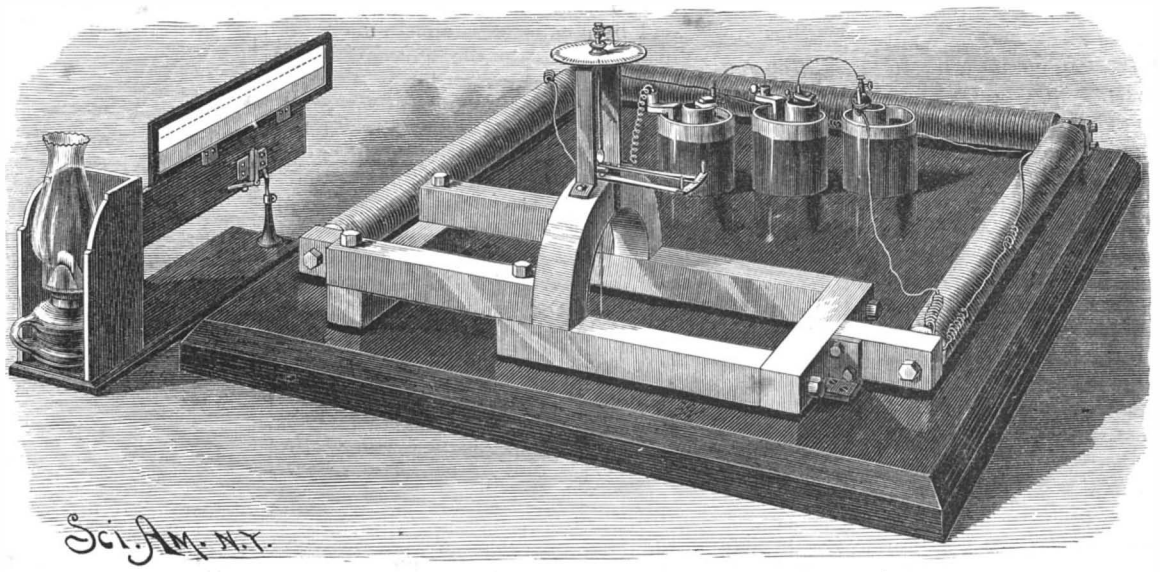

Fig. 1.—EDISON'S MAGNETIC BRIDGE.

Constructed with sufficient care and attention to details, the magnetic bridge may without doubt be made a most valuable instrument of precision for the furtherance of scientific research. The theory of its action is extremely simple, and it is the exact counterpart of an ordinary Wheatstone bridge constructed for measuring low resistance and immersed in water, since, now, whatever is true electrically of the one is true magnetically of the other. Not only may the laws of magnetic conductivity be investigated by means of this balance for all para and dia magnetic bodies, but the variation of this conductivity under the action of various physical agencies, such as heat, pressure, strain, etc., may be determined. It is in the belief that this instrument may contribute something to the advancement of electrical science, and with the hope that it may do so, that I venture to bring it to the notice of my fellow members of the American Association.

* Abstract of paper read before the American Association for the Advancement of Science, New York, August, 1887.

THEY make a wine of tomatoes in Florida which is said to be superior to orange wine.

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Electrical Items.

An Electrical Copying Process.—Mr. Garel has just invented a very simple apparatus for obtaining a certain number of copies of a letter or circular. The inventor writes with an ordinary black pencil upon very thin paper, which rests upon a block of carbon. The plumbago of the pencil communicates with one of the terminals of a small induction coil, and the carbon with the other. The point of the pencil gives a series of sparks, and the paper can be used as a stencil for the reproduction of the writing by passing an ink roller over it.

The Dip of the Magnetic Needle.—Mr. G. A. Rowell, of Oxford, England, has just published a pamphlet on atmospheric electricity and the causes of the changes in the inclination of the magnetic needle. The author attempts to demonstrate that the magnetic poles of Europe and America coincide with the centers of the greatest cold upon the two continents. He attributes the shifting of the magnetic poles to the same series of astronomical and geological phenomena that produce the secular changes in climate. This theory, he adds, leads us to the not very agreeable conclusion that our winters will be prolonged and will increase in severity, since the magnetic inclination keeps on diminishing.

Conversion of Heat into Electricity.—Messrs. Hurghausen and Nerust have recently performed an experiment which is very curious from a scientific point of view. On placing a thin sheet of metal in a magnetic field and keeping its two extremities at unequal temperatures, they remarked that the extremities exhibited a very feeble, yet appreciable, difference of potential. Moreover, the direction of the current varied according to the direction of the lines of force of the magnetic field. The experimenters operated with a plate of bismuth, 5 centimeters square and 2 millimeters in thickness, placed in a field of 5,000 units. The difference in temperature was obtained by placing against the ends of the plate two sheets of mica, one of which dipped into cold water and the other was heated by the flame of a gas burner. Under such circumstances, a difference of potential of 0·00125 volt was obtained.

Welding by Electricity.—The process of welding invented by Mr. De Benardoz, of Russia, is now applied industrially by the Society for the Electrical Working of Metals. The pieces to be welded are placed upon a cast iron plate supported by an insulated table and connected with the negative pole of a source of electricity. The positive pole communicates with an electric carbon inserted in an insulating handle. On drawing the point of the carbon along the edges of the metal to be welded, the operator closes the circuit. He has then merely to raise the point slightly to produce a voltaic arc whose high temperature melts the two pieces of metal and causes them to unite. The intensity of the current naturally varies with the work to be done. For regulating it, a battery of accumulators is used, and the number of the latter is increased or diminished as need be. This process of welding is largely employed in the manufacture of metallic tanks and reservoirs.

Manufacture of Carbons for Arc Lamps.—The manufacture of carbons for arc lamps has become a large industry in the United States. During the course of a recent trial at Cleveland, Ohio, concerning the infringement of a patent, it transpired that there are 150,000 carbons daily used in this country, 100,000 of which are manufactured at Cleveland, where there are twenty furnaces. The carbons are made from the residua of petroleum distillation, as well as from the carbonaceous deposits found around natural gas wells. The materials are finely pulverized, mixed with a little pitch, and placed in moulds, which are packed in boxes and put into a furnace, where they are submitted to an intense heat. The capacity of an ordinary furnace is 45,000 crayons. By means of a movable covering, which forms the original part of the patent that gave rise to the controversy alluded to above, two furnaces are constructed side by side, and one of these is charged while the other is heated. With this system, two men can charge one furnace per day. The crayons are baked for five days, and the cooling takes twenty-four hours.

Telephony in St. Louis.—The subscribers of the telephone line in St. Louis, says an exchange, do not pay a fixed subscription to the company, but merely the sum of five cents for each communication. The collection of this sum is effected automatically by the apparatus itself. Above the transmitter there is a box containing a slit in the upper part. When the subscriber wishes to communicate with any one, he places a five cent piece in the slit and takes the receiver from its hook. The coin, in sliding, closes a circuit, a call is made at the central office, and the subscriber can talk as long as he pleases, either with the office or another subscriber. When the conversation is finished, he has only to hang up the receiver in order to give an automatic signal to break the communication, and the coin falls into a box whose key is carried by the company's collector.

If the person with whom the subscriber wishes to speak is already in communication, the employe of the central office informs him of the fact by means of a contact upon which he presses, and which sets a mechanism in operation that drives the coin to the side of the box; and when the subscriber hangs up his receiver, the money is returned to him. More than two hundred of these apparatus are now in operation in St. Louis, and are giving very good results.

Dissipating the Smoke of Cannons.—The discovery, by Mr. Lodge, of the curious effect of discharges of static electricity upon dust and vapor has been utilized by Mr. J. G. Lorrain in the construction of an apparatus for the dissipation of the smoke derived from the discharge of ordnance of every kind.

Mr. Lorrain proposes to employ an electrostatic generator in communication with appropriate conductors arranged around the mouth of the gun. As a conductor, he prefers a light wire lattice provided with points that permit of obtaining silent discharges in the air. The generator that he proposes is Wimshurst's, this being less affected by dampness than most others. It may be placed anywhere, and be actuated by any kind of motive power desired.

Notable Chemical Exhibits.

One of the most interesting exhibits in the chemical section of the London exhibition is that of Dr. Theodor Schuchardt, of Gorlitz, in Germany, consisting of an excellent collection of rare and new chemical preparations, especially those used in scientific, medical, pharmaceutical, photographic, and technical work.

A large amount of time and labor must have been expended in order to bring before the public this proof of the great progress chemistry is making in her ever extending relations with the different branches of natural history. We here see 67 inorganic and 190 organic compounds which have never before been produced in such quantity, and at the same time in such a state of purity.

The first section consists principally of the rare elements and those compounds of other elements which may justly be called rare, considering the difficulties to be overcome in their manufacture. First among these we notice selenium and tellurium, both similar to sulphur in their chemical reactions, and found in very few minerals. The pure selenium is shown in very good hexagonal crystals, and the tellurium in the form of brilliant needles of metallic luster. "Germanium," one of the newest elements discovered by Professor Winkler, is also shown. Up to the present time it has only been found in one mineral, and that a rare one, named "argyrodite," found at Freiberg. Its chemical reactions are of great interest, its salts being of a very soluble character.

Among the other metalloids exhibited by this firm we may mention a box containing large crystals of silicium and brilliant leaf-shaped crystals of zirconium. Oxide of zirconium is at present attracting some attention with regard to its magnificent incandescent properties when used in the Welsbach lamp, and it is not improbable that its preparation may before long develop into an industry of some importance. Among the metals exhibited we note two tubes containing potassium and sodium melted in presence of hydrogen, thus preserving their true metallic luster.

There are also to be seen the newly described cubes of chloride of lime mixed with gypsum, which render it possible to obtain an easily regulated current of pure chlorine gas. Salts of cerium, yttrium, erbium, as well as the metals indium and gallium in spectroscopic purity, are also shown. The last two metals would in all probability never have been discovered except for the spectroscope, as they occur in such minute proportions; the zinc ore near Freiberg, in which indium was discovered, contains only 0·1 per cent of that metal, while gallium, which may be called one of the rarest metals, is found in "black jack" in no larger quantity than 0·001 per cent. Its production in quantity is therefore a matter of extreme delicacy, requiring great care, but it has been successfully carried out by a new method discovered in Dr. Schuchardt's laboratory. Gallium is here shown both in solid and liquid forms, and it is the first time that crystals of this metal have been publicly exhibited.

Another interesting body is osmic acid, shown in the form of brilliant fern-like crystals. It has long been used in physiological studies as a means of distinguishing between nerves and veins. The second section, consisting of organic compounds, contains all the most recently discovered and interesting bodies in this branch of chemical science. We first mention "thiophen," a new organic sulphur compound, which is now being manufactured in considerable quantity by this firm. Formerly obtained in the distillation of coal tar, it is now produced from succinate of sodium and phosphide of sulphur.

Following the catalogue, attention will be drawn to the compounds of croconic acid. There are also its intermediate products, such as diactyl-hydrochinon, etc. Of greater interest may be naphthyl-phenyl-keton-dibromide, which is of great service to mineralogists in optical work, on account of its great refractive power; a similar value is attached to the heavy iodide of methylen, used for determining the specific gravity of precious stones, etc.

Of the numerous alkaloids exhibited, "wrightin" takes the first place. It is the only alkaloid free from oxygen. It is found in plants, and when in a state of great purity, as in the present instance, it takes the form of long white needles. Other alkaloids here exhibited are hydrastin, from *Hydrastis canadensis*, possessed of great crystallizing powers; scapolin, from *Scapolia saponica*, which is of an extremely poisonous nature, even when diluted to 1 in 5,000; and many more. Among other interesting specimens we find a collection of vegetable dyes, chlorophyl, chlorophyllan, phyllopurpurin, orcein, and the interesting group of nitrogen compounds.

We cannot conclude without mentioning two new test papers invented by Charles Wurster; one saturated with dimethyl-para-phenylendiamin enables us to detect the presence and quantity of wood fiber in any paper, while the other, saturated with terta-methyl-para-phenylendiamin, will detect the smallest quantity of active oxygen. The property of the latter paper is of great importance, as by its means the hygienic value of the air at any place can be readily ascertained.—*Chem. News.*

Colors for Polished Brass.

Mr. E. Ebermeyer has just published in the *Zeitschrift fur der Chemie Indust.* formulas for a number of baths, designed to give polished brass various colors.

The brass objects are put into boiling solutions composed of different salts, and the intensity of the shade obtained is dependent upon the duration of the immersion.

With a solution composed of:

Sulphate of copper	120 grains.
Hydrochlorate of ammonia	30 "
Water	1 quart.

greenish shades are obtained. With the following solution, all the shades of brown from orange brown to cinnamon are obtained:

Chlorate of potash	150 grains.
Sulphate of copper	150 "
Water	1 quart.

The following solution gives the brass first a rosy tint and then colors it violet and blue:

Sulphate of copper	435 grains.
Hyposulphite of soda	300 "
Cream of tartar	150 "
Water	1 pint.

Upon adding to the last solution:

Ammoniacal sulph. of iron	300 grains.
Hyposulphite of soda	300 "

there are obtained, according to the duration of the immersion, yellowish, orange, rosy, then bluish shades. Upon polarizing the ebullition, the blue tint gives way to yellow, and finally to a pretty gray. Silver, under the same circumstances, becomes very beautifully colored.

After a long ebullition in the following solution, we obtain a yellow brown shade, and then a remarkable fire red:

Chlorate of potash	75 grains.
Carbonate of nickel	30 "
Salt of nickel	75 "
Water	10 ounces.

The following solution gives a beautiful dark brown color:

Chlorate of potash	75 grains.
Salt of nickel	150 "
Water	10 ounces.

The following gives, in the first place, a red, which passes to blue, then to pale lilac, and finally to white:

Orpiment	75 grains.
Crystallized sal sodæ	150 "
Water	10 ounces.

The following gives a yellow brown:

Salt of nickel	75 grains.
Sulphate of copper	75 "
Chlorate of potash	75 "
Water	10 ounces.

On mixing the following solutions, sulphur separates and the brass becomes covered with iridescent crystallizations:

I.

Cream of tartar	75 grains.
Sulphate of copper	75 "
Water	10 ounces.

II.

Hyposulphite of soda	225 grains.
Water	5 ounces.

Upon leaving the brass objects immersed in the following mixture, contained in corked vessels, they at length acquire a very beautiful blue color:

Hepar of sulphur	15 grains.
Ammonia	75 "
Water	4 ounces.

THE locomotive industrial works of the United States have been very busy lately, in the production of new motors for the increasing traffic of our own and foreign roads. This is shown very forcibly in the report of the last six months' production of the Baldwin Locomotive Works, Philadelphia. With a labor force of 2,000 men, 318 locomotives, nearly two per day, have been finished. Orders for 150 more are in hand, and it is expected that the output for the year will reach the grand total of 650.

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ENGINEERING INVENTIONS.

An injector has been patented by Mr. Elijah Ware, of Omaha, Neb. It has an ejecting cone, combination cone, and overflow pipe, in combination with a steam inlet valve, water valve, and an overflow valve adapted to be connected with the inlet port of the steam valve, so as to cause suction in the overflow pipe, and means for operating the three valves simultaneously, with other novel features.

A dredge has been patented by Mr. Henry O. Geiger, of Tacoma, Washington Ter. A shaft is arranged within a suction pipe and provided with an Archimedean screw, there being mechanism for raising and lowering the pipe with its screw, with other novel features, the rotation of the screw agitating the sand, clay, or mud at the bottom of rivers, etc., so that it is forced to ascend the suction pipe.

A car coupling has been patented by Messrs. Levy and David Rosenthal, of Hudson, N. Y. The drawhead has spring-actuated doors and means for opening them, a spring-actuated drawer being adapted to slide beneath the drawhead and support the link, a shaft journaled beneath the sill of the car carrying ratchet wheels being connected with the drawer, and a pawl-carrying shaft being adapted for co-operation with the ratchet-carrying shaft.

Feeding air to steam boiler furnaces forms the subject of a patent issued to Messrs. Alanson Horton and Benjamin J. Wright, of Hammondsport, N. Y. The invention consists of a fan or its equivalent connected to the boiler, the fan being provided with means for regulating the amount of air supplied to the boiler, whereby the draught may be greatly increased without increasing the height of the stack, and all kinds of fuel can be better burned.

AGRICULTURAL INVENTIONS.

A lister cultivator has been patented by Mr. Joseph P. Lutes, of Ridgeley, Mo. It is specially adapted for working listed corn, and is designed to work the corn in the gutters or furrows made by the lister, and at the same time smooth the ridges between the corn and feed fresh soil to the same.

A corn and cotton planter has been patented by Mr. Jesse A. Childs, of Coushatta, La. It has a reciprocating cylinder, whereby the distance between the hills may be exactly met, and a cut-off regulating mechanism for measuring with great exactness the quantity of seed discharged into each hill, with other novel features.

A combined cultivator and corn planter has been patented by Mr. Emil Westhoff, of Cuero, Texas. It is designed to be self-covering and adjustable as to the transverse and longitudinal space between the hills and rows, and to be regulated as to the material fed at each throw of the seed slide, and also to mark off the adjacent row as the machine advances.

A low-binding harvester has been patented by Messrs. J. C. and George A. Cunningham, of Washington, Kansas. It is so constructed that the grain is carried to the binding mechanism by means of a continuous endless carrier belt arranged upon a level with or slightly above that of the binding table, one of the main objects being to carry the grain directly to the binding table.

MISCELLANEOUS INVENTIONS.

An improvement in the ornamentation of wall paper has been patented by Mr. Charles H. Provost, of Brooklyn, N. Y. The invention consists in the method of distributing on a wet or dry ground color or bronze, so that the bronze will appear upon the color, and then the paper is embossed.

A method of and apparatus for making fibrous vessels, such as pails, tubs, etc., has been patented by Mr. Leroy Tobey, of Penn Yan, N. Y. It consists in drawing fibrous material held in suspension, such as paper or rag pulp, on to a perforated form immersed in the liquid, continuing the suction afterward to dry the fiber, then soaking the vessel so formed in a hardening compound, and pressing and finishing.

A folding baby carriage has been patented by Mr. Charles Haller, of New York City. The invention covers an improvement on two former patented inventions of the same inventor, simplifying the construction of the carriage, and rendering it lighter, less liable to disarrangement, and more convenient in use.

A windmill has been patented by Mr. Hanford Reynolds, of Gifford, Ill. It is so constructed that its wings can be automatically adjusted in accordance with the force and direction of the wind, and with the power required, and can be readily thrown in or out of action, the mill requiring no vane or other device for adjusting it in accordance with the direction of the wind.

A wheel for grooving machines has been patented by Mr. Sabin F. Brown, of Dawson, Minn. It is for grooving together tin and other sheet metal by passing the wheel once forward and back over the seam, and is made in three parts, one part to be lowered to stand flush with the edges of the other parts, or raised to form the offset, the movable part of the wheel being acted upon by an eccentric and crank.

A suspender or other buckle has been patented by Mr. Charles R. Harris, of Williamsport, Pa. This invention relates to combined buckles and lower hooks or loops capable of manipulation or adjustment from the front, and in which the buckle frame is made of wire and has combined with it a rear toothed cross bar that engages with the web passing through the buckle frame.

A vehicle hub has been patented by Mr. Burwell C. H. Simpson, of Lebanon, Tenn. This invention covers a novel construction, whereby the spokes may be securely clamped, and so as to allow renewal of either the spokes or felly sections, and also to allow tightening of the tire by expansion of the felly sections by endwise thrust of the spokes when wedged outward from the hub.

A device for stuffing mattresses has been patented by Mr. John R. De Haven, of Cloverport, Ky. It consists of a stand supporting loose slats and a removable head piece, of side bars having points on one end, of bottom plates, and of top rods supported by the head piece and by a U-shaped frame pivoted to the stand, enabling an operator to fill a mattress tick rapidly and evenly.

A corset has been patented by Mr. Milton J. Roberts, of New York City. Its distinctive feature is that it is woven over a form into curvilinear contour out of wire strands, the meshes having a greater number of twists in some parts of the corset than in others, and the corset being designed especially to support the body and relieve the sufferings of the deformed or crippled, although otherwise advantageously applicable.

A knife cleaner has been patented by Mr. Robert W. Jamieson, of Prince Albert, Saskatchewan, Northwest Territory, Canada. The machine has two pairs of rubbing blocks, a lower pair for use first as cleaning blocks and an upper pair for use as polishing blocks, the blocks being faced with leather or other suitable fabric, to which the cleaning or polishing powder is supplied, by which the knives may be cleaned at both sides and the back, without strain on the handle.

An artificial ear drum has been patented by Mr. Benjamin N. Huestis, of New York City. It consists of a cup-shaped body having an annular flange and provided with a hollow stem closed at its outer end, which may be inserted or withdrawn without pain to the wearer, will be wholly invisible when worn, the wearer being able to sleep with comfort with the drum in position, it being designed to relieve deafness to a greater extent than has heretofore been possible, and when the natural drum has been lost.

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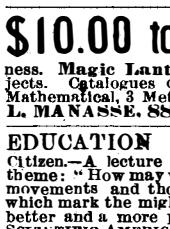

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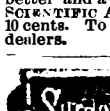

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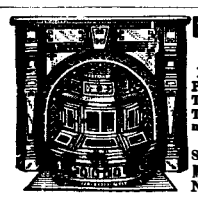

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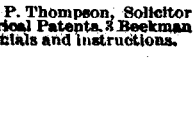

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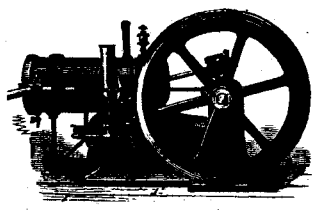

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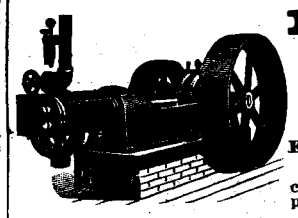

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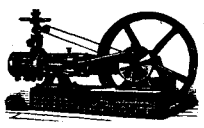

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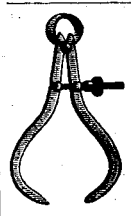

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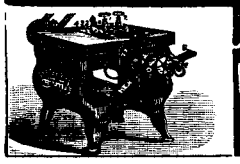

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NAVY DEPARTMENT,
WASHINGTON, *August* 13, 1887.

Sealed proposals, from domestic manufacturers of steel, to furnish twenty-two sets of steel forgings for 6-inch B. L. rifle guns, all oil-treated, annealed, and in accordance with drawings and specifications prepared in the Bureau of Ordnance, will be received at the Navy Department until Tuesday, the 27th day of September, 1887, at 12 o'clock, noon, at which time the proposals will be opened.

The kinds of forgings required and the estimated quantities of each (aggregating about one hundred and thirty-six tons), are set forth in the specifications, which, together with blank forms of proposals and of contract, and copies of the drawings and any other information desired, can be obtained on application to the Bureau of Ordnance, Navy Department.

The contract will be awarded for the forgings as a whole. No proposal for less than the whole will be entertained, nor will any proposal be considered unless accompanied by satisfactory evidence that the bidder is in possession of a plant adequate to the production and delivery of the required forgings. All the forgings delivered under the contract must conform in material, manufacture, and quality to the aforesaid drawings and specifications, and must successfully pass the required inspection and tests.

The successful bidder will be required, within ten days after notice of award, to enter into a formal contract binding himself to deliver one set of gun-forgings not later than December 31, 1887, and not less than one set every twenty-one days thereafter, and to complete the deliveries within fifteen months from the date of the contract. A bond, in a penal sum equal to 15 per cent. of the total contract price, must accompany the contract.

Each proposal must be accompanied by a certified check, payable to the order of the Secretary of the Navy, in an amount not less than 5 per cent. of the total amount of the bid. Checks of unsuccessful bidders will be returned within five days after the bids are opened. The check of the successful bidder will be returned when he shall have executed the formal contract and furnished the requisite bond. In case of his failure to comply with this stipulation, the check will become the property of the United States.

All proposals must be in duplicate, enclosed in envelopes marked "Proposal for Steel Gun-Forgings," and addressed to the Secretary of the Navy, Navy Department, Washington, D. C.

The right is reserved to waive defects in form and to reject any or all bids.

WILLIAM C. WHITNEY,
Secretary of the Navy.

Proposals for Steel-cast Guns for the Navy.

NAVY DEPARTMENT,
WASHINGTON, D. C., *June* 23, 1887.

Under authority conferred by the act of Congress, approved March 3, 1887, making an appropriation "for the purchase and completion of three steel-cast, rough-bored and turned, six-inch, high-power rifle cannon, of domestic manufacture, one of which shall be of Bessemer steel, one of open-hearth steel, and one of crucible steel," sealed proposals from domestic manufacturers, to furnish the same, will be received at this Department until Tuesday, the second day of August, 1887, at 12 o'clock noon, at which time the proposals will be opened.

Proposals may be made either to furnish three completely finished six-inch, breech-loading, high-power rifle cannon, made from unforged castings, one of Bessemer steel, one of open-hearth steel, and one of crucible steel, or three unforged, rough-bored and turned castings for such cannon, of the same material, respectively, to be finished by the Department in accordance with the bidder's design.

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No gun or casting for a gun will be paid for until the gun "shall have been completed and have successfully stood the statutory test required by the act of July twenty-sixth, eighteen hundred and eighty-six," entitled "an act making appropriations for the naval service for the fiscal year ending June thirtieth, eighteen hundred and eighty-seven, and for other purposes." [For statement of requirements of said tests, and of other conditions to be observed, reference is made to "specifications" which can be had upon application to the Department.]

Proposals may be made for one or more guns or for one or more castings as aforesaid, * * * [but must be made separately for each gun, or casting for a gun, and upon forms prepared by the Department.]

Each successful bidder will be required to execute within fifteen days after notice of award, a formal contract in accordance with his proposal, and to furnish a bond, with satisfactory sureties, in a penal sum equal to fifteen per cent. of the amount of his bid, conditioned for the faithful performance of such contract.

Copies of the specifications, with blank forms of proposals, and all additional information desired, can be obtained on application to the Bureau of Ordnance, Navy Department.

All proposals must be in duplicate, inclosed in envelopes marked "Proposals for Steel-cast Cannon," and addressed to the Secretary of the Navy, Navy Department, Washington, D. C.

The right is reserved to waive defects in form and to reject any or all bids.

WILLIAM C. WHITNEY,
Secretary of the Navy.

NAVY DEPARTMENT,
WASHINGTON, D. C., *July* 20, 1887.

In order to give more time to domestic manufacturers to consider the matter, the period limited for the reception of proposals for steel cast guns is hereby extended, and such proposals will be received, under the foregoing advertisement, as modified, until Tuesday, September 20, 1887, at 12 o'clock noon, at which time the proposals will be opened.

WILLIAM C. WHITNEY,
Secretary of the Navy.

Proposals for three Overhead Travelling Cranes complete, three Supports for such Cranes, and one Iron Frame for a Building.

NAVY DEPARTMENT,
WASHINGTON, D.C., *July* 23, 1887.

Sealed proposals will be received at the Navy Department, Washington, D. C., until 12 o'clock noon, on Thursday, the 15th day of September, 1887, at which time and place they will be opened in the presence of bidders, for furnishing the necessary material and labor and constructing, delivering and erecting the iron work for the supports of three overhead travelling cranes, the frame of one building, and three overhead travelling cranes complete, including attachments pertaining thereto, for the Ordnance Gun-shops at the Navy Yard, Washington, D. C., in accordance with plans which may be seen, and specifications, copies of which, together with all other information essential to bidders, may be obtained at the Office of the Civil Engineer at said Navy Yard. Proposals must be made in accordance with forms which will also be furnished on application to that Office.

Proposals must be made in duplicate and inclosed in envelopes marked "Proposals for Overhead Travelling Cranes complete, for Iron Supports for such Cranes, and Iron Frame for a Building," and addressed to the Secretary of the Navy, Navy Department, Washington, D. C.

The Secretary of the Navy reserves the right to reject any or all bids, as, in his judgment, the interests of the Government may require.

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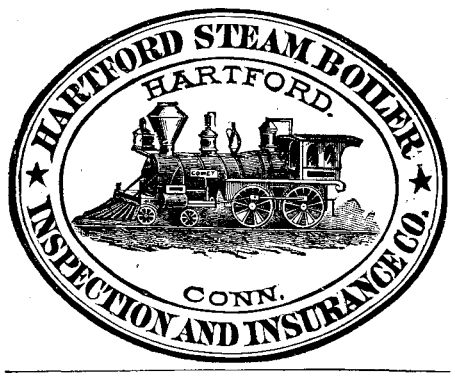

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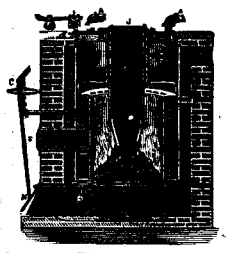

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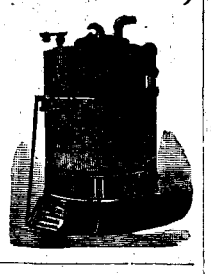

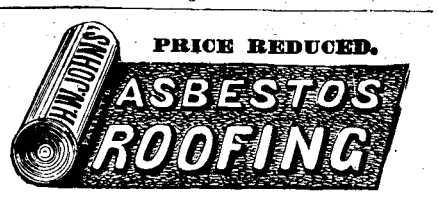

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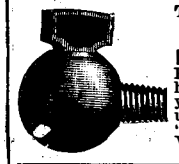

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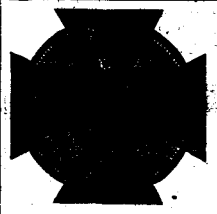

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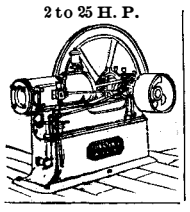

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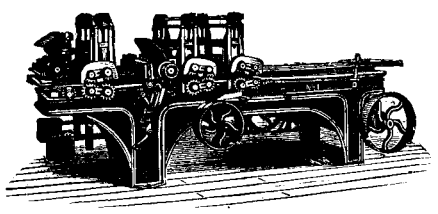

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